CHINHOYI UNIVERSITY OF TECHNOLOGY

FRAMEWORK FOR ENHANCING EDUCATIONAL TECHNOLOGY ADOPTION BY ADULT LEARNERS IN ZIMBABWE'S VOCATIONAL TRAINING CENTRES

BY

EUNICE DHOKURA

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CENTRE FOR DEVELOPMENT STUDIES

CHINHOYI, ZIMBABWE

Supervisors: Prof. M.Tsvere

Doctor S. Munikwa

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APPROVAL FORM

The undersigned certify that they have read and recommended to the Research and Graduate Studies Directorate, Chinhoyi University of Technology, for acceptance of a Doctoral thesis titled, "Framework to Enhance Technology Adoption among Adult Learners in Zimbabwean Vocational Training Centres submitted by Eunice Dhokura, in fulfilment of the requirements for the Doctor of Philosophy Degree in Lifelong Learning and Development Studies.

Professor M. Tsvere

Name of Main Supervisor

_____ Signature

29 September 2024

Date

Doctor S. Munikwa

Name of Co-supervisor

_____ Signature

29 September 2024

Date

DECLARATION

I, Eunice Dhokura, declare that this Doctoral Thesis is my own effort and is a true reflection of research executed by me. This research in full or part thereof has not been submitted for examination for any degree at any other university/institution.

Eunice Dhokura

Name of Student

_____ Signature

30 September2024

Date

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Glory to the King of Kings for we walk by faith, not by sight.

ACRONYMS

AEO:	Agricultural Extension Officers
ANOVA:	Analysis Variance
DIT:	Diffusion of Innovations
DGBL:	Digital Game-Based Learning
ELF:	English as a Lingua Franca
ECT:	Expectation Confirmation Theory
H0:	Null Hypothesis
ICT:	Information and Communication Technology
JET:	Joint Education Trust
NICE:	National Institute for Excellence
PDA:	Personal Digital Assistants
PU:	Perceived Utility
PEOU:	Perceived Ease of Use
SAMR:	Substitution Augmentation Modification Redefinition
SEM:	Structural Equation Models
SFOTO:	Student Facilitator Organisation Technology Outcome
SPSS:	Statistical Package for Social Sciences
TAM:	Technology Acceptance Model
TDCB:	Technology Pedagogical Content Knowledge
TEFL:	Teaching English as a Foreign Language
TPB:	Theory of Planned Behaviour
TRA:	Theory of Reasonable Action
TVET:	Technical and Vocational Education and Training
UK:	United Kingdom
UTAUT:	Unified Theory of the Acceptance and Use of Technology
VETA:	Values Enhanced Technology Adoption
VTC:	Vocational training centres

ABSTRACT

The study centred on enhancing educational technology adoption through adult learning in Zimbabwean Vocational Training programmes. The study adopted a mixed methods approach and employed an explanatory sequential design This study aims to develop a comprehensive framework to enhance the adoption of educational technologies among adult learners in Zimbabwean vocational training centres. Despite the potential benefits of technology in improving educational outcomes and skills acquisition, the integration of such technologies has been inconsistent, and hindered by factors such as inadequate infrastructure, insufficient training, and varying attitudes towards technology. This research identifies the types of educational technologies currently utilized in vocational training programmes and analyses the key factors influencing their adoption. Additionally, it evaluates adult learners' attitudes towards modern educational technologies and assesses the competency of facilitators in implementing these tools effectively. By synthesising these insights, the study proposes a strategic framework designed to promote and facilitate the effective adoption of educational technologies, ultimately enhancing the learning experience and employability of adult learners in Zimbabwe. The findings aim to inform policymakers, educators, and training institutions on best practices for technology integration in vocational education. An explanatory sequential research design was employed as the research paradigm. Semi-structured questionnaires, a closed questionnaire, an observation checklist and an interview guide were used as the research instruments. Random sampling was used to select participants for quantitative data whereas purposive sampling was used to select respondents for the interviews. Three hundred and forty respondents were selected for the quantitative part whereas ten were selected for the qualitative phase. Quantitative data were analysed through descriptive statistics whereas qualitative data was coded into thematic areas for analysis. The study also recommends that the Ministry of Youth Empowerment, Development and Vocational Training could enhance the Technology Acceptance Model (TAM), and the Diffusion and Adoption Theory. The TAM is an information systems theory that models how users come to accept and use technology. The Diffusion and Adoption Theory on the other hand, is a more general framework that tries to explain how people adopt new ideas, products and services. In addition, the Student Facilitator, Organisational, Technology and Outcome (SFOTO) framework which could be applied in other similar educational contexts, was highlighted. The researcher suggested that further study could be done on the challenges faced by adult learners in educational technology adoption in vocational training centres in Zimbabwe.

Keywords: institution, education, motivation, innovation, vocation and adoption

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.0. Introduction

This study aims to introduce a framework that enhances educational technology adoption through adult learning in vocational training centres (VTCs). This chapter looks at the background of the study, statement of the problem, study objectives, research questions, the significance of the study, study delimitation and its limitations.

1.1. Background to the study

The integration of educational technology in vocational training centres and colleges has been a growing concern globally, with various countries in Europe, America, Asia, Africa, and Sub-Saharan Africa grappling with the issue of enhancing educational technology to improve learning outcomes (OECD, 2019). In the United States, a 2020 report by the National Centre for Education Statistics found that while 95% of schools had access to the internet, there were still significant disparities in terms of the quality of technology infrastructure and the ability of teachers to effectively integrate technology into instruction. In Europe, countries such as Finland and Sweden have made significant strides in integrating technology into vocational education, with a focus on developing digital skills and competencies (Ulander-Wänman, 2022). However, other European countries, such as Greece and Italy, still face challenges in adopting educational technology due to limited resources and infrastructure (European Commission, 2020).

UNESCO's report found that many countries lack clear policies and strategies for integrating technology into education, which has hindered the effective use of technology to improve learning outcomes. UNESCO's 2018 report on ICT in education found that only 44% of schools worldwide had access to computers, and only 22% had access to the internet. In America, the United States has made notable progress in incorporating technology into vocational education, with initiatives such as the Career and Technical Education (CTE) programme that aims to improve the quality and relevance of training programmes (Taie & Goldring, 2020). However, disparities in access to technology and digital literacy remain a concern, particularly in rural and underserved areas (Hussar & Bailey, 2014).

In Asia, countries such as South Korea and Singapore have invested heavily in educational technology, focusing on developing cutting-edge digital infrastructure and innovative pedagogies (Byun & Slavin, 2020; Tan, 2021). Another study was carried out on the skills and competencies required to adopt technology (Bizami et al., 2023). However, other Asian countries, such as Indonesia and the Philippines, face challenges in adopting educational technology due to limited resources and infrastructure (Dhar, 2020).

In Africa, the African Development Bank report has established that many countries have made significant progress in increasing access to technology. "Despite significant progress in improving access to technology, disparities in terms of quality and equity persist. While some countries have made significant strides in developing their digital economies, others are still lagging behind" (African Development Bank, 2020, p. 34). In Africa and Sub-Saharan Africa, the adoption of educational technology in vocational training centres and colleges has been slow due to various challenges, including limited access to technology, poor infrastructure, and inadequate digital literacy (UNESCO, 2020). However, initiatives such as the African Virtual University and the UNESCO Institute for Information Technologies in Education aim to address these challenges and promote the adoption of educational technology across the continent (African Virtual University, 2020; UNESCO Institute for Information Technologies in Education, 2020).

Vocational training has been recognised as a key driver of economic development and poverty reduction. The African Union's Continental Strategy for Technical and Vocational Education and Training (TVET) aims to promote youth employment, entrepreneurship, and innovation.

In Zimbabwe, a 2019 report by the Ministry of Primary and Secondary Education found that only 15% of schools had access to computers, and only 5% had access to the internet. Specifically, the adoption of educational technology in vocational training centres and colleges has been hindered by limited resources, inadequate infrastructure, and a shortage of trained facilitators (Ministry of Higher and Tertiary Education, 2020). This study aims to investigate the current state of educational technology adoption in vocational training centres in Zimbabwe, identify factors that influence its adoption and to develop a comprehensive framework for enhancing the adoption of modern educational technologies.

The role of a Vocational Training Centre (VTC) is to impart skills and knowledge to adult learners in different adult education programmes offered at the institution. In Zimbabwe, a few national policies inform the role of Vocational Training Centres. These include the Zimbabwe National Employment Policy Framework, which focuses on employment services like placement assistance, career guidance, and job creation measures. TVET Policy Review, which aims to improve Technical and Vocational Education Training in Zimbabwe. National Youth Policy 2020-2025, which provides a guiding framework for Zimbabwean youth. Zimbabwe National Qualification Framework (ZNQF), which aims to green and mainstream entrepreneurship in Vocational Training Centres and Training programmes.

The curriculum in VTCs is designed to equip adult learners with the skills and knowledge necessary for employment, entrepreneurship, and personal development. To achieve this, the curriculum typically includes a range of subjects such as business and entrepreneurship, technology and computer skills, industry-specific skills (e.g., hospitality, agriculture, construction), and life skills (e.g., communication, teamwork, problem-solving). Technology use is important in VTCs for enhancing the learning experience; technology can make learning more engaging, interactive, and accessible. Adult learners need to be proficient in using technology to communicate, access information, and perform tasks in the workplace. Most industries rely on technology, so learners need to be familiar with the tools and software used in their chosen field. International studies have shown that effective technology integration in education can lead to improved learning outcomes, increased student engagement, and better preparation for the workforce (PISA, 2015; OECD, 2019). In related institutions, learners are prepared for technology use through digital literacy programmes, online courses and resources, technology-enabled project-based learning and collaborative learning activities using technology. Therefore, adult learners at vocational training centres must have opportunity to acquire new educational technology skills. Local policies include Provincial education policies (e.g., Provincial Education Act, Provincial Education Policy), District education policies (e.g., District Education Policy, District Education Plan) and Institutional policies (e.g., VTC's own policies, procedures, and guidelines) (OECD, 2023).

The researcher argues that although several studies on the use of technology in Vocational Training Centres by adults in Zimbabwe were carried out including the report from the Ministry

of Higher and Tertiary Education on the Technical and Vocational Education and Training Review Framework in February 2005, the Vocational Training Centres still lag behind in terms of using technology. It is against this background that the researcher proposed a framework that enhances educational technology adoption by adult learners in Vocational Training Centres (VTCs) in Zimbabwe (Phuthi & Mazarire, 2022).

This study is significant in that the effective adoption of educational technology by adult learners in Vocational Training Centres is crucial for skill development, employability, and overall economic growth. In today's rapidly evolving digital landscape, individuals with strong technological skills have a competitive edge in the job market. By addressing the challenges and barriers to educational technology adoption in VTCs, this research contributes to empowering adult learners with the necessary skills and knowledge to succeed in the modern workplace. Additionally, VTCs may also be influenced by other policies, such as industry-specific policies (e.g., policies related to apprenticeships, internships, or work-based learning), funding and financing policies (e.g., policies related to government funding, grants, or private investment) and quality assurance and accreditation policies (e.g., policies related to programme accreditation, certification, or quality standards).

Despite the existing research, there was a lack of clarity specifically on educational technology adoption by adult learners in VTCs in Zimbabwe. The unique challenges faced by adult learners in vocational settings, their specific needs, and the barriers they encountered have not been extensively studied. Additionally, existing literature lacks a robust theoretical framework that addressees the complex interactions between adult learners, vocational training centres and educational technology adoption.

This study contributes to the existing knowledge by providing a comprehensive understanding of the specific challenges faced by adult learners in Vocational Training Centres in Zimbabwe regarding educational technology adoption. It develops a theoretical framework that addresses the unique contextual factors and interactions influencing technology adoption in vocational settings, and identifies effective strategies and interventions that promote educational technology adoption among adult learners. This was done considering their digital literacy levels, cultural backgrounds, and learning preferences. The study offers evidence-based recommendations for

policymakers, Vocational Training Centres, and educators to enhance educational technology integration and create supportive environments for adult learners. Ultimately, the study facilitated the development of tailored interventions and policies that could enhance educational technology adoption among adult learners, leading to improved vocational training outcomes, increased employability, and overall economic growth in Zimbabwe.

The outcome of this assessment would be a comprehensive framework for enhancing technology adoption by adult learners in Vocational Training Centres in Zimbabwe. This framework could guide the development of interventions, policies, and practices aimed at promoting the effective integration of technology into vocational training programmes. The goal was to improve the quality of adult learning experiences, enhance workforce readiness, and contribute to the socio-economic development of Zimbabwe.

The adoption of technology in vocational training centres is crucial for improving educational outcomes and enhancing the skill sets of adult learners. In Zimbabwe, vocational training plays a vital role in equipping individuals with practical skills necessary for employment and entrepreneurship. However, the integration of educational technologies in these programmes has been inconsistent, often hindered by various factors such as infrastructure, training, and attitudes towards technology.

Research indicates that educational technology can significantly enhance learning experiences by providing interactive and engaging content, facilitating remote learning and improving access to information (Kirkwood & Price, 2022). Despite these benefits, many adult learners in Zimbabwean VTCs face challenges in adopting new technologies due to insufficient training, lack of resources, and resistance to change (Munyoro, 2020).

Moreover, the role of facilitators in technology adoption is critical. Facilitators must possess the necessary skills to effectively integrate technology into their teaching practices. Studies show that the competency of educators is a significant predictor of successful technology implementation in educational settings (Koehler et al., 2020; Rodriguez et al., 2020). In fact, research highlights that educators' technological pedagogical content knowledge (TPACK) is a crucial factor in effectively integrating technology into their teaching practices (Chai et al., 2020).

This study aims to develop a comprehensive framework that addresses these challenges and promotes the effective adoption of educational technologies among adult learners in Zimbabwean vocational training centres. By identifying existing technologies, analysing influencing factors, evaluating learner attitudes, and assessing facilitator competencies, this research seeks to provide actionable recommendations for enhancing technology adoption.

1.2. Statement of the problem

Though there were numerous research findings from developed countries, many existing studies were conducted in different cultural and educational contexts, making it challenging to directly apply their findings to the specific needs and challenges of Vocational Training Centres in Zimbabwe (Guner & Actarturk, 2020; Radha et al., 2020; Al-Malah et al., 2023; Pulatova, 2023). Many of the empirical studies focused on perspectives, challenges and factors affecting the adoption of educational technology in different institutions which is too broad and too general as compared to a framework towards the adoption of educational technology specifically in Vocational Training Centres. There is also a need to conduct similar research in a Zimbabwean context in as far as enhancing technology adoption is concerned so that generalisations can be made.

The integration of educational technology in Zimbabwean VTCs is crucial for enhancing the learning experiences of adult learners and improving their employability. However, the adoption of these technologies remains suboptimal due to several challenges. Many vocational training institutions lack adequate infrastructure and resources to support modern educational technologies (Munyoro, 2020). Furthermore, there is often a gap in training for both facilitators and learners, leading to low confidence and proficiency in using these tools (Nguyen et al., 2022; Albrecht et al., 2022). Research highlights that inadequate training and support can hinder the effective integration of technology in educational settings (Kaplan-Rakowski et al., 2022). Moreover, studies show that facilitators' lack of confidence and proficiency in using technology can negatively impact learners' experiences and outcomes (Santoso et al., 2022).

Additionally, the attitudes of adult learners towards technology can significantly influence its adoption. Research indicates that negative perceptions and resistance to change hinder the effective use of educational technologies in vocational training environments (Tondeur et al.,

2017). This situation is exacerbated by a lack of strategic frameworks tailored to the unique contexts of Zimbabwean Vocational Training Centres which can guide the integration of technology. Without a comprehensive framework that addresses these issues, the potential benefits of educational technology will remain untapped, limiting the effectiveness of vocational training programmes and the skills development of adult learners. This study seeks to identify and analyse the factors influencing technology adoption in this context and develop a framework that facilitates effective integration.

This study, therefore, sought to develop a framework that enhances educational technology adoption through adult learning in Vocational Training Centres. By conducting an in-depth analysis of the unique challenges faced by adult learners in VTCs in Zimbabwe, this research aims to develop a tailored framework that could provide practical guidelines for promoting technology adoption in the local context. The study considers the specific cultural, social, and economic factors within Zimbabwe to ensure the framework's relevance and effectiveness in the local context. Through empirical research and data analysis, this study generates evidence-based recommendations for policymakers, educators, and VTCs to facilitate the effective integration of technology into adult learning environments and enhancing workforce readiness. By promoting technology adoption among adult learners, this research aims to enhance their digital literacy, employability, and overall preparedness for the demands of the modern workforce in Zimbabwe.

1.3. Aim

The main research objective, guided by the study was to develop a framework for enhancing educational technology adoption through adult learning in Vocational Training Centres in Zimbabwe.

1.3.1 Objectives

The objectives of this study are to:

1. Establish the types of educational technology currently utilised in Vocational Training programmes.

2. Analyse factors influencing the adoption of educational technology in adult learning.

3. Evaluate adult learners' attitudes toward the adoption of modern educational technology.

4. Assess the competency of facilitators to implement modern educational technologies.

5. Design a comprehensive framework for enhancing the adoption of modern educational technologies.

1.4. Research questions

The study sought to provide answers to the following research questions:

1. What types of educational technologies are currently utilised in vocational training programmes in Zimbabwe?

2. What are the key factors influencing the adoption of educational technology among adult learners in Vocational Training Centres?

3. How do adult learners perceive the adoption of modern educational technologies?

4. What is the competency level of facilitators implementing modern educational technologies in Vocational Training Centres?

5. What elements should be included in a comprehensive framework to enhance the adoption of modern educational technologies in vocational training settings?

1.5. Research Hypothesis

The study was conducted under the following research hypothesis: -

H0 The integration of educational technology has no significant effect on the effectiveness of vocational training programmes.

H1 The integration of educational technology significantly enhances the effectiveness of vocational training programmes.

1.6. Assumptions of the Study

The study was conducted under the following assumptions: -

- The respondents and participants of enhancing educational technology adoption through adult learning in VTCs were going to be willing to participate in the study.
- The respondents to the question of enhancing educational technology adoption through adult learning in VTCs were not only going to participate but also to proffer accurate and well-informed responses.
- Both primary and secondary data about the issue of enhancing educational technology adoption through adult learning in VTCs were going to be accessible.

1.7. Significance of the study

The significance of this study lies in its potential to contribute to the improvement of educational technology adoption in VTCs in Zimbabwe.

1.7.1. To the Researcher

Completing this study fulfilled the requirements for the researcher's doctorate degree in Lifelong Learning and Development Studies, a crucial milestone in her academic journey. Conducting this research enhances her research skills, enabling her to design, implement, and evaluate research projects more effectively. This boosts her confidence and expertise in researching and analysing complex topics. The successful completion of this study may open new career opportunities and advancement possibilities, allowing the researcher to take on more challenging roles and make a greater impact in her field.

1.7.2. To the Government

This research would contribute to the achievement of Vision 2030 in Zimbabwe, which is driven by innovation and the application of new technologies.

1.7.3. To the Stakeholders

The stakeholders of Vocational Training Centres in Zimbabwe who will benefit from this study include:

Teachers and instructors: They will learn how to effectively integrate technology into their teaching practices, improving student engagement and learning outcomes.

Graduates: They will benefit from improved access to quality education and training, leading to better employment opportunities and increased productivity.

Vocational Training Centre administrators: They will gain insights into the importance of investing in educational technology and how to create a supportive environment for technology adoption.

Policy-makers: They will learn how to develop policies that support the integration of technology in VTCs, aligning with national goals and global trends.

Private Sector Partners: They will understand the benefits of collaborating with VTCs and investing in educational technology to develop a skilled workforce

Parents and Guardians: They will see the value of enrolling their children in VTCs that offer technology-enhanced learning experiences, leading to better employment prospects.

1.7.4. To the institution (Chinhoyi University of Technology)

The institution would learn to enhance educational technology adoption through adult learning in VTCs. The university would also assess the student's research to comprehend and implement the principles of Information and Communication Technology (ICT).

1.7.5. To the Policy Makers

The research was important to policy makers as it would form the basis for coming up with ways to enhance educational technology adoption through adult learning in VTCs by implementing the framework to be developed.

1.8. Delimitations of the Study

The study only focused on VTCs in Zimbabwe, which may limit the generalisability of the findings to other countries or regions. It also has a limited sample size, which could restrict the accuracy and reliability of the findings. The study was conducted within a specific time frame

(2021-2024), which may not allow for longitudinal analysis or consideration of long-term impacts. It relied on self-reported data or surveys, which could be subject to biases or limited by the respondents' willingness to participate.

1.8.1. Study Delimitation

Delimitation enables the study to sets parameters spatially and temporally, in terms of the study variables and the type of population to be included in the study.

1.8.2 Spatial Boundaries of Vocational Training Centres

Vocational Training Centres are dotted throughout the country in all provinces of Zimbabwe. For example, we have Chitungwiza VTC in Harare to the north, Ruwa VTC to the east, and Masvingo VTC to the south just to mention a few.

1.8.3 Temporal parameters of the study

The research was narrowed down to Vocational Training Centres for enhancing technology adoption by adult learners.

1.8.4 The parameters of the study variables

The study was confined to the framework enhancing educational technology adoption in Zimbabwean Vocational Training Centres.

1.8.5 Study population parameters

Various factors influenced the determination of the study's population. The population was based on the whole population strata of five VTCs in Zimbabwe. It came up with a population category, which was found to be key towards the study's success. The study population targeted staff and graduates at Vocational Training Centres.

1.9 Limitations of the Study

These are the potential weaknesses or constraints of the study that may affect the validity, reliability, or generalisability of the results which include:

1.9.1 Small sample size or limited population

The study only targeted five vocational training centres namely: Ruwa, Masvingo Urban, Chitungwiza, Mt Hampden, and Mushagashe. This sample may not be representative of all Vocational Training Centres in Zimbabwe. This limits the generalisability of the findings.

1.9.2 Lack of a control group or comparison group

The study did not have a control group or comparison group to contrast the adoption of educational technology in Vocational Training Centres with and without the framework. This makes it difficult to determine the effectiveness of the framework.

1.9.3 Limited generalisability to other contexts or settings

The study only focused on VTCs in Zimbabwe, which may have unique cultural, economic, or infrastructure contexts. The findings may not apply to other types of educational institutions or settings.

1.9.4 Reliance on self-reported data or survey responses

The study relied on data collected through questionnaires or interviews, which may be subject to biases or inaccuracies. This may impact the validity of the findings.

1.9.5 Limited scope or depth of investigation

The study has explored all relevant factors influencing the adoption of educational technology in Vocational Training Centres such as infrastructure, policy, or teacher training.

1.9.6 Methodological limitations

Although the study employed a mixed-methods approach which provided a comprehensive understanding of the adoption process, the quantitative component may have been limited using self-reported data or questionnaire responses, which may be subject to biases or inaccuracies. Additionally, the qualitative component was limited by the small sample size or limited depth of exploration, which may not have captured the full range of experiences and perspectives.

1.9.7 Time constraints or limited access to resources

The study may have faced time or resource constraints, limiting the scope or depth of the investigation.

1.9.8 Potential biases or assumptions

The research design or instrumentation has been influenced by assumptions or biases. There is an assumption that all Vocational Training Centres have equal access to technology or infrastructure.

1.10 Definition of key terms

Adoption

Adoption is the choice to fully exercise improvement as the best course of action available, while denial is the result of not adopting (Smith, 2022). In the context of this study, it is the process of accepting and integrating innovation into one's practice.

Adult

According to the World Health Organisation (WHO, 2022), an adult is a person older than 19 unless national law delimits an earlier age, and an adolescent is someone aged 10 to 19. Adult is a noun and an adjective, both of which refer to something mature, no longer a child. An adult means a person 19 years or older enrolled at a Vocational Training Centre.

Adult learner

An adult learner or, more commonly, a mature student, is an older person involved in learning forms (Oxford Dictionary, 2022). An adult learner is a student 19 years or older enrolled in a Vocational Training Centre.

Adult learning

Adult learning is the method by which adults acquire skills, knowledge, and capabilities (Merriam, 2020). This is the process of adult learners acquiring skills and knowledge in a Vocational Training Centre.

Attitude

In psychology, an attitude refers to emotions, beliefs, and behaviour toward a particular object, person, thing, or event (Oxford Dictionary, 2022; Hyland, 2023). This is a person's positive or negative disposition towards educational technology.

Competency

Competence is the set of demonstrable characteristics and skills that enable and improve efficiency or performance on a job. Competency is a series of knowledge, abilities, skills, experiences and behaviours which lead to effective performance in an individual's activities (Oxford Dictionary, 2023). These are the skills and knowledge required for effective performance in a particular job or occupation.

Influence

Influence is the capacity to influence the character, development, or behaviour of someone or something, or the effect itself (Collins Dictionary, 2023). The impact of educational technology on adult learners' skills and knowledge.

Enhance

Enhance is intensify, increase, or further improve the quality, value, or extent of (Collins Dictionary, 2022). In other words, it is to improve adult learners' skills and knowledge through educational technology.

Facilitator

A facilitator is a person who helps a group of people to work together better, understand their common objectives, and plan how to achieve these objectives, during meetings or discussions. In doing so, the facilitator remains "neutral", meaning they do not take a particular position in the

discussion (Oxford Dictionary, 2022). A facilitator is a teacher or instructor who supports adult learners in using educational technology.

Learning

Learning is a process that leads to change, which occurs because of experience, and increases the potential for improved performance and future learning (Kirschner & Hendrick, 2020). Learning is the process of adult learners acquiring new skills and knowledge in a Vocational Training Centre.

Technology

Technology is defined as a system shaped by humans that uses knowledge and organisation to produce objects and techniques to attain specific goals (Merton, 2020). The term also refers to digital tools, platforms, and resources that are used in Vocational Training Centres to support teaching and learning.

Vocational

This refers to the training programmes or courses offered in Vocational Training Centres to prepare learners for a specific occupation.

Vocational Training (Centres)

Vocational training refers to instructional programmes or courses that focus on the skills required for a particular job function or trade (Oxford dictionary, 2022). These are institutions that offer vocational training programmes and courses to adult learners.

Vocational training programmes

Vocational training programmes/courses are specific classes offered to learners training for a particular job or career (Miller, 2022). Vocational training programmes are the specific courses or classes offered in VTCs that prepare learners for a particular career or occupation, such as welding, plumbing, or culinary arts.

1.11 Chapter Summary

This chapter sets the stage for the study by providing a comprehensive background, statement of the problem, research objectives, research questions, significance, assumptions, limitations, and delimitations. The research explored the context of Vocational Training Centres in Zimbabwe, highlighting the challenges and gaps in current research. The research aims to investigate the effectiveness of vocational training programmes in preparing graduates for careers in administration. It posed five research questions to guide the inquiry and emphasised the significance of this study for policymakers, educators, and graduates. Acknowledged were the assumptions, limitations, and delimitations of the study, setting the boundaries for investigation. Finally, the chapter defined key terms to ensure clarity and precision in the discussion.

CHAPTER TWO

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.0 Introduction

This chapter reviews the literature on enhancing technology adoption through adult learning in vocational training centres. The literature gives an overview of the main works and provides a brief discussion of the relevant literature which addresses the key research objectives of the study. Literature review, theoretical framework, empirical review and conceptual framework are related to enhancing technology adoption through adult learning in vocational training centres. This critical information aimed at identifying the missing gaps, as propounded by Gachago et al., (2022), highlights that critically evaluating the literature lays the foundation for a research project.

2.1 Theoretical Framework

Lai (2016) noted that the rate at which payment systems develop depends largely on a struggle between rapid technological change and natural barriers to new product or service acceptance. Several theories have been proposed to explain consumers' acceptance of new technologies and their intention to use them. The role of theory is to describe concepts and their relationships, which assists one to comprehend a phenomenon and focus on possible new outcomes. In this way, no single theory on its own can entirely explain the concept of adoption of educational technology at vocational training centres; hence the need to explain theories in their various contexts. This study was grounded in two theories: the Technology Acceptance Model (TAM) (Venkatesh et al., 2020) and Theory of Diffusion of Innovations (DIT) (Rogers, 2010). These theories better explain the process of adoption of educational technology in VTCs. However, the researcher put more emphasis on Technology Acceptance Model (TAM). The TAM is a widely recognised and extensively used model for understanding the acceptance and adoption of technology, including educational technology. It has been applied in various domains and has proven to be effective in explaining user acceptance of technology in educational settings.

The TAM focuses on the attitudes and perceptions of users toward technology adoption. In the context of VTCs, understanding the factors that influence the acceptance of educational

technology by instructors, administrators, and learners is crucial for successful implementation (Alhaimer, 2023). The TAM provides a framework to assess and analyse these factors. It offers a straight forward and practical approach for assessing the adoption of educational technology. It consists of two primary constructs: perceived usefulness and perceived ease of use. Perceived Usefulness is defined as the potential user's subjective likelihood that the use of a certain system (for example, single platform E-payment System) will improve his/her action. Perceived Ease of Use refers to the degree to which the potential user expects the target system to be effortless (Davis, 1989). The belief of the person towards a system may be influenced by other factors referred to as external variables in TAM. By examining these factors, researchers can gain insights into the factors that influence technology adoption in VTCs and make informed decisions to promote technology acceptance and usage.

The TAM has been widely used and validated across different technology adoption contexts, including educational settings. Its applicability has been demonstrated in numerous studies (Chuttur, 2009; Lee et al., 2013), making it a suitable choice for investigating the adoption of educational technology in VTCs. It provides a clear framework for identifying and addressing barriers to technology acceptance. By understanding the factors that influence perceived usefulness and ease of use, researchers can propose interventions and strategies to enhance technology adoption in VTCs. This can lead to practical recommendations and guidelines for educators, administrators, and policymakers.

While other theories may also provide valuable insights into the adoption of educational technology in VCTs, the emphasis on the TAM is justified due to its relevance, user-centred approach, simplicity, broad applicability, and potential for actionable insights. The researcher leveraged the TAM to gain a comprehensive understanding of the factors influencing technology acceptance and made informed decisions to facilitate the successful implementation of educational technology in VTCs. TAM's focus on user beliefs and attitudes aligns with the study's emphasis on understanding vocational training centre users' pespectives on educational technology adoption. Its versatility in various contexts and technologies allows the researcher to apply it to educational technology adoption in VTCs. By understanding the factors that influence users' intentions to adopt educational technology, the researcher can inform strategies to promote successful implementation and improve user engagement.

2.1.1 Aspects of the study informed by TAM

TAM guides the development of research questions related to users' perceptions of educational technology, such as "What factors influence Vocational Training Centre users to adopt educational technology?" TAM informs the design of surveys, interviews, or focus groups to collect data on users' perceived usefulness, ease of use, and intentions to adopt educational technology. TAM's constructs are used to analyse data and identify relationships between users' beliefs, attitudes, and intentions to adopt educational technology. It helps interpret the results, highlighting the significance of perceived usefulness and ease of use in predicting users' intentions to adopt educational technology. It informs strategies to improve educational technology adoption, such as enhancing user experience, providing training and support, and highlighting the benefits of technology use.

2.1.2 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was introduced by Fred Davis in 1989 for his doctorate proposal, as shown in Figure 2.1 An adaptation of the Theory of Reasoned Action, TAM is specifically tailored for modeling users' acceptance of information systems or technologies (Davis, 1989; Lee et al., 2022).

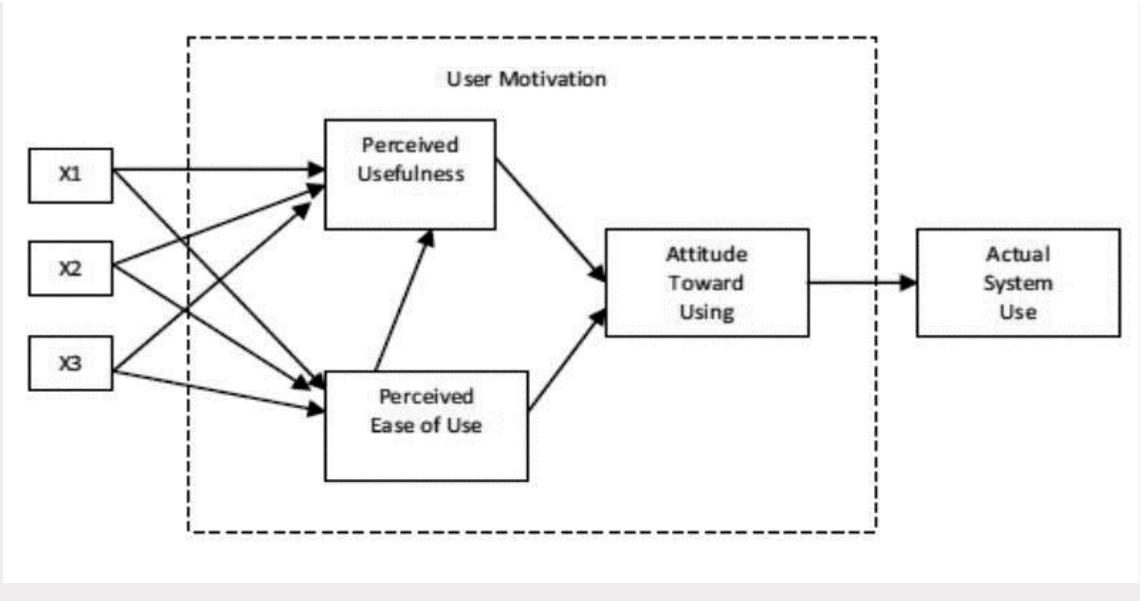


Figure 0.1: Original Technology Acceptance Model (TAM) (Davis, p. 322, 1989)

In 1989, Davis used TAM to explain computer usage behaviour as shown in the diagram - the goal of Davis' (1989). TAM explain the general determinants of computer acceptance that lead to explaining users' behaviour across a broad range of end-user computing technologies and user populations. The basic TAM model included and tested two specific beliefs: Perceived Usefulness (PU) and Perceived Ease of Use (PEU). Perceived Usefulness is defined as the potential user's subjective likelihood that the use of a certain system (e.g: single platform E-payment System) will improve his/her action and Perceived Ease of Use refers to the degree to which the potential user expects the target system to be effortless (Davis, 1989). The belief of the person towards a system may be influenced by other factors referred to as external variables in TAM.

Matching this theory to the adoption of educational technology in VTCs confirmed the basic relationships between the three variables of TAM: that perceived ease of use is positively associated with perceived usefulness and behavioural intention; and perceived usefulness is also positively associated with behavioural intention. Graduates' attitude to educational technology is influenced by both the perception of the usefulness of mobile learning and the ease of use of mobile technology. Positive attitudes about the benefits of mobile learning were found to influence the adoption of mobile learning (Scherer et al., 2019). By applying the theory, the study can gain a deeper understanding of how graduates' perceptions and attitudes influence their adoption and use of mobile learning and inform strategies to promote effective integration of educational technology in VTCs.

2.1.3 Theory of Diffusion of Innovations (DIT)

Rogers' (2003) theory of diffusion of innovation has been widely used to explain how innovations are adopted and spread among individuals and organisations. More recent studies have built upon Rogers' work, such as the study by Behravan et al., (2022) which explored the role of social influence in the diffusion of innovation. Another study by Kim et al., (2020) examined the impact of communication channels on the adoption of innovations.

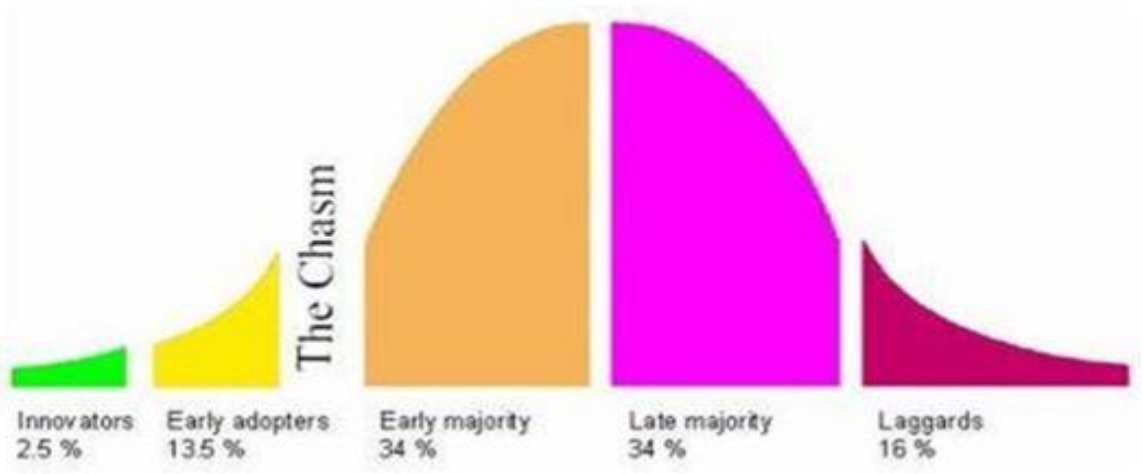


Figure 0.2: S-shaped adoption curve of innovators, early adopters, early majority, late majority, and laggards (Rogers, 2003, p. 266)

The diagram depicts a bell curve or normal distribution curve with categories of technology adopters. The categories mentioned are innovators, early adopters, early majority, and late majority. These categories represent different groups of individuals or organisations based on their willingness to adopt technology.

Also, Rogers (2003) noted, incomplete adoption and non-adoption do not form part of this adopter classification. Only adopters of successful innovations generate this curve over time. In this normal distribution, each category is defined using a standardised percentage of respondents. By understanding which category your respondents fall into, one can tailor his/her strategies to encourage adoption and implementation of educational technology in VTCs. For example, one may want to target early adopters and early majority instructors with professional development opportunities and support to help them integrate technology into their teaching practices... For instance, the area lying under the left side of the curve and two standard deviations below the mean includes innovators who adopt an innovation as the first 2.5% of the individuals in a system.

2.1.3.1 Innovators

For Rogers (2003), innovators were willing to experience new ideas. Thus, they were prepared to cope with unprofitable and unsuccessful innovations, and a given level of uncertainty about the

innovation. Also, Rogers added that innovators are the gatekeepers bringing innovation in from outside of the system. They may not be respected by other members of the social system because of their ventures oneness and close relationships outside the social system. Their ventures oneness requires innovators to have complex technical knowledge. Therefore by embracing innovation and technology, Zimbabwean Vocational Training Centres can enhance the learning experience and outcomes for adult learners, ultimately contributing to the country's economic growth and development.

2.1.3.2 Early Adopters

Compared to innovators, early adopters are more limited by the boundaries of the social system. Rogers (2003) argued that since early adopters are more likely to hold leadership roles in the social system, other members come to them to get advice or information about the innovation. In fact, "leaders play a crucial role in the innovation process, from initiation to implementation, particularly in allocating resources that drive innovation forward" (Gao et al., 2022, p. 12). Thus, as role models, early adopters' attitudes towards innovations are more influential. Their subjective evaluations of the innovation are shared with other members of the social system through interpersonal networks (Gao et al., 2022). By understanding the role of innovators in the diffusion of innovations curve, one can better support and empower them to champion educational technology adoption in Vocational Training Centres and address potential resistance or scepticism from others. Early adopters exhibit leadership in adopting innovation. They also decrease uncertainty about the innovation in the diffusion process. Finally, early adopters accept a new idea by adopting it (Rogers, 2003).

2.1.3.3 Early Majority

Rogers (2003) claimed that although the early majority has good interaction with other members of the social system, they do not have the leadership role that early adopters have. However, their interpersonal networks are still important in the innovation-diffusion process. As Figure 2.1 has shown, the early majority adopt the innovation just before the other half of their peers adopt it. As Rogers stated, they are deliberate in adopting an innovation and they are neither the first nor the last to adopt it. Thus, their innovation decision usually takes more time than it takes innovators and early adopters. By understanding the characteristics and role of the early majority

in the diffusion of innovations curve, we can develop strategies to support and engage this group, such as providing training and support, showcasing success stories, and building a community of practice around educational technology adoption.

2.1.3.4 Late Majority

Like the early majority, the late majority includes one-third of all members of the social system who wait until most of their peers have adopted the innovation. Although they are skeptical about the innovation and its outcomes, economic necessity and peer pressure may lead them to adopt the innovation. To reduce the uncertainty of the innovation, interpersonal networks of close peers should persuade the late majority to adopt it. Then, "the late majority feels that it is safe to adopt" (Rogers, 2003, p. 284). By understanding the characteristics and concerns of the late majority, you can develop targeted strategies to support and encourage their adoption of educational technology, helping to drive further innovation and improvement in vocational training centres.

2.1.3.5 Laggards

As Rogers (2003) stated, laggards have the traditional view, and they are more skeptical about innovations and change agents than the late majority. As the most localised group of the social system, their interpersonal networks mainly consist of other members of the social system from the same category. Moreover, laggards do not have a leadership role. Because of the limited resources and the lack of awareness and knowledge of innovations, they first want to make sure that an innovation works before they adopt it. Thus, laggards tend to decide after looking at whether the innovation is successfully adopted by other members of the social system. Due to all these characteristics, the laggards' innovation-decision period is relatively long. In addition to these five categories of adopters, Rogers (2003) further described his five categories of adopters in two main groups: earlier adopters and later adopters. Early adopters consist of innovators, early adopters while late majority and laggards comprise later adopters. Rogers identifies the differences between these two groups in terms of socioeconomic status, personality variables, and communication behaivours, which usually are positively related to innovativeness. For instance, "the individuals or other units in a system who most need the benefits of a new idea (the less educated, less wealthy, and the like) are generally the last to adopt an innovation"

(Rogers, 2003, p. 295). For Rogers, there was no significant difference between the ages of earlier adopters and later adopters, however, this categorisation and its characteristics were beyond this study. By understanding these groups and their characteristics, one can develop targeted strategies to support and encourage the adoption of educational technology among all instructors, ultimately driving innovation in Vocational Training Centres.

Technology-Related Studies Based on Rogers' Theory

According to Rogers (2003, p. 10), "diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system." Rogers claimed that there are four main elements of diffusion: innovation, time, communication channels, and social systems (Rogers, 2003). These elements have been further elaborated on by subsequent researchers. The idea, practice, or object that is developed and is the focus of the adoption (Rogers, 2003; Hwang & Christensen, 2022); the acceptance rate of the innovation over time (Rogers, 2003; Kim & Lee, 2020); and communication channel relating to how the innovation is introduced or marketed to an individual (Rogers, 2003; Tuten & Solomon, 2022) are all critical elements of diffusion.

The social structure and relationships that influence the adoption of innovation have been addressed in the existing litereture (Rogers, 2003; Vasileiou & Giudice, 2022). Social systems are the elements (such as individuals, groups, organisations and/or subsystems) that are involved in the adoption of innovation. Of interest in understanding what factors influence the adoption of technology in an educational setting is Roger's (2003) element of Innovation, this addresses the nature of the technology itself. This element highlights those characteristics of the innovation that increase its potential for adoption. The following section examines the relationship between the characteristics of innovation and their influence on adoption.

Innovation characteristics for the adoption of mobile technology

Rogers (2003) states that the successful adoption of an innovation must have the following characteristics: the innovation must be seen to be better than existing technology or practices; it must be compatible with the users' needs; it should be available for trial and should have been successfully used by others; and it should not be complex to use or difficult to learn. These

characteristics and their implications for the future adoption of mobile technology used for teaching and learning are discussed below.

The first condition for adoption is that new technology must have a relative advantage over older technology (Rogers, 2003). Research has shown that relative advantage has a positive relationship with adoption (Al-Gahtani, 2016; Liao & Lu, 2020). For instance, a study on mobile learning adoption found that perceived usefulness and ease of use were significant predictors of intention to use (Wang et al., 2020).

The second condition is compatibility, which refers to the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters (Rogers, 2003). Compatibility has been found to be a significant predictor of adoption in various studies (Kaur & Sharma, 2020; Lee et al., 2020), the third condition of Rogers (2003), is the extent to which the innovation can be tested and experimented with before its introduction. Related to trialability are the characteristics of observability of the innovation. Observability involves prospective users having the opportunity to see the innovation successfully in use before they use it themselves (Rogers, 2003). Several researchers have noted that educators are often hesitant to adopt mobile learning due to a preference for observing others implement it first in their courses (e.g., Alrasheedi & Capretz, 2016; Dominguez et al., 2020; Khatoon et al., 2020). This hesitance highlights the importance of observability in the adoption process, as educators want to see evidence of the innovation's effectiveness and feasibility before adopting it themselves.

The final condition identified by Rogers (2003) is the complexity of an innovation. If the mobile technology requires considerable time for the user to learn to use it, it is less likely that educators and graduates will persevere. Rogers (2003) explained that the learning experience is influenced by the context, including the time and location of the learning, the learner’s goals and motivation, their surroundings and others around them. These factors are crucial in mobile learning, where learning can occur anywhere, and the added mobility enables learning in various settings. These settings will require different tools and needs, and it's essential to consider them, especially regarding how they fit the learning context, to ensure a positive learning experience (Wang et al., 2020).

Rogers' (2003) diffusion model predicts that for the innovation of mobile technology to be adopted in an educational context it needs to show relative advantage over other technologies, such as e-learning, and should not be too complex to use. In addition, users, especially educators, need to see mobile learning in action and be given a chance to try out the technology themselves. It is important to consider not only the characteristics of an innovation but also the process of adoption. Several theories have evolved from Roger's original work to explain why individuals accept or resist technologies.

It is within this context that the Theory of Diffusion of Innovations was adopted in this study to support VTCs in the adoption of educational technology such as mobile technology, to give an organisation sustainable competitive advantage. The theory was also embraced to assess the learning experience which was influenced by the context, including the time and location of the learning, the learner's goals and motivation and their surroundings. The diffusion of innovations theory proposes that the adoption of an innovation is influenced by several factors, including:

1. Relative advantage: The perceived benefit of the innovation over existing solutions.
2. Compatibility: The degree to which the innovation aligns with existing values, beliefs, and practices.
3. Complexity: The ease of use and understanding of the innovation.
4. Trialability: The opportunity to test or try out the innovation.
5. Observability: The visibility of the innovation's benefits and results.

These factors influence the likelihood and speed of adoption, which is a critical aspect of understanding how mobile learning is adopted and used in different contexts. As such, this theory is very important to this study, as the researcher borrowed the ideas of the theory to explain the need for adoption of educational technology in vocational training centres in Zimbabwe.

However, theory of 'diffusion of innovation' was to establish the foundation for conducting research on innovation acceptance and adoption and may not be sufficient to explain the whole phenomena under study. Hence the researcher supported this theory with the following other theories.

2.1.3.4 Purpose of using Technology Acceptance Models (TAM) and Rogers' Diffusion of Innovations Theory

Using multiple theories in a single research study can provide a more comprehensive understanding of the phenomenon being investigated especially if they complement. The Technology Acceptance Model (TAM) can help understand how users perceive and accept technology, examining the impact of perceived usefulness and ease of use on technology adoption. The Theory of Reasoned Action (TRA) can help study the relationship between attitudes, beliefs, and behaviour, and showing how attitudes towards technology influence behaviour.

Rogers' Diffusion of Innovations Theory (DOI) can clarify how innovations spread and are adopted, as well as examining the factors influencing adoption, such as relative advantage, compatibility, and observability. By combining these theories, the researcher can gain a deeper understanding of technology adoption and acceptance, and clarify the complex relationships between attitudes, beliefs, and behaviour. Together, TAM and Rogers' theory provide a comprehensive understanding of technology adoption:

1. TAM helps explain individual-level adoption, while Rogers' theory explains the broader social and cultural context.

2. TAM's perceived usefulness and ease of use align with Rogers' relative advantage and compatibility.

3. TAM's attitude towards technology is influenced by Rogers' social influence and communication channels.

4. Rogers' theory's focus on innovation characteristics (e.g., trialability, observability) complements TAM's emphasis on technology characteristics (e.g., usefulness, ease of use).

Using multiple theories can provide a more nuanced understanding of the research phenomenon, allowing for the examination of multiple perspectives. It can increase the validity and reliability

of the findings and contribute to the development of a more comprehensive theoretical framework.

2.1.3.5 Relevant frameworks to the study

This study investigates the current state of educational technology adoption in Vocational Training programmes in Zimbabwe, identify the key factors influencing its adoption among adult learners, and explore the perceptions of adult learners towards the adoption of modern educational technologies.

This study drew on the following theoretical frameworks to inform its investigation:

- TPACK framework (Mishra & Koehler, 2006): To examine the technological pedagogical content knowledge of facilitators in Vocational Training Centres.

- ADDIE model (Molenda, 2003): To inform the design and development of educational technology adoption strategies in VTCs.

- Rogers' Diffusion of Innovations theory (Rogers, 1995): To understand the factors that influence the adoption of educational technology among adult learners.

- SAMR + C model (Puentedura, 2010): To examine the levels of technology integration in teaching and learning in vocational training centres.

- SAMR model (Puentedura, 2006): To examine the levels of technology integration in teaching and learning in VTCs.

2.2 Types of Educational Technology

There are four types of educational technology: synchronous, asynchronous, linear learning, blended and collaborative learning (Neelakantha & Sultana, 2022).

2.2.1 Synchronous and Asynchronous

Synchronous and asynchronous are types of educational technology. Due to new inventions being made every day, graduates can learn in or out of the classroom. Learning can be self-paced with the help of various resources available on the internet; currently graduates can learn online through distance learning programmes or in virtual classrooms (Chen, 2023).

Synchronous learning refers to real-time learning environments where graduates and instructors interact simultaneously, often through digital platforms (e.g., video conferencing, and live chats). This allows for immediate discussion, feedback, and collaboration (e.g., Boelens et al., 2022; Kartal et al., 2022). In synchronous learning, graduates can engage with each other and the instructor at the same time, fostering a sense of community and promoting active learning (e.g., Singh et al., 2022).

Synchronous learning refers to a mode of learning where graduates and instructors engage in real-time interactions and participate in learning activities simultaneously. In this context, "synchronous" indicates that learners and educators are connected and engaged in learning at the same time, regardless of their physical locations. Some examples are where people are online and working jointly, like face-to-face discussions, chat rooms or virtual classrooms, live teaching and feedback sessions, Skype conversations, etc. Since the graduates are working in groups, they widen the range of their thinking by listening to others' thoughts about the same topics. This also helps in learning and gathering more information which will further result in boosting their knowledge.

2.2.1.1 Advantages of synchronous learning technologies:

1. Enhanced collaboration: Real-time interaction fosters teamwork, communication, and problem-solving.

2. Immediate feedback: Instructors and peers provide instant feedback, clarifying doubts and improving understanding.

3. Increased engagement: Synchronous learning encourages active participation, reducing feelings of isolation.

4. Time-efficient: Simultaneous learning and feedback save time, as questions are addressed promptly.

5. Accessible: Reach graduates globally, transcending geographical constraints.

2.2.1.2 Disadvantages of synchronous learning technologies:

1. Technical issues: Connectivity problems, poor internet bandwidth, and platform glitches can disrupt learning.

2. Limited flexibility: Graduates must adhere to a fixed schedule, which can be challenging for those with conflicting commitments.

3. Distractions: Virtual environments can be prone to distractions, decreasing focus and productivity.

4. Equity and access: Not all graduates have equal access to devices, internet, or digital literacy, thereby creating a digital divide.

5. Instructor training: Effective use of synchronous technologies requires instructors to develop new skills and adapt pedagogies

2.2.2 Asynchronous

Asynchronous learning refers to activities that occur "not in real-time" (Mayer et al., 2022). This type of learning allows graduates to access materials and complete assignments on their own schedule, without the need for simultaneous interaction with instructors or peers. This means that graduates can access and engage with course materials, discussions, and assignments at any time and from any location, without the need for simultaneous participation. Asynchronous learning often involves pre-recorded videos, online discussions, and self-paced activities, allowing graduates to learn at their own convenience and pace. Logs, emails, online textbooks, audio/video courses, hypertext documents and wikis are all part of asynchronous learning. Asynchronous learning refers to a mode of learning where graduates and instructors engage in learning activities at different times and locations. In this context, "asynchronous" indicates that

learners and educators do not need to be present or connected simultaneously for learning to occur.

Asynchronous learning is facilitated by various technologies, primarily Learning Management Systems (LMS), which enable graduates and instructors to engage in learning activities at their own pace and convenience. Key affordances of LMS that support asynchronous learning include: Instructors can upload and organise course materials, such as videos, readings, and assignments, for graduates to access at any time. Graduates can participate in online discussions, sharing thoughts and ideas, and respond to peers' posts at their own pace. Graduates can submit assignments and instructors can provide feedback, all within the LMS, without the need for simultaneous interaction. Instructors can create and administer quizzes and assessments, which graduates can complete at their own pace. Instructors can record and share video and audio content, allowing graduates to access and review material at their convenience. Instructors can control the release of course content, allowing graduates to access materials only at specified time. Instructors can monitor student engagement and progress, identifying areas where graduates may need additional support (Bozalek, 2017). In this type of educational technology, graduates can learn at their tempo. If they don't understand the lesson at once, they can read it again without falling behind in the class. While online courses offer flexibility and convenience, allowing graduates to balance their studies with internships, work, or sports, it's essential to consider the potential drawbacks. For instance: self-motivation and discipline: graduates may struggle with procrastination and staying motivated without direct instructor supervision. Online courses can lack the social interaction and human connection that traditional classrooms provide. Platform glitches, connectivity problems, and poor video quality can hinder the learning experience. Not all students have equal access to reliable internet, reliable devices, or are digital literate; this creates a digital divide. Online courses may lack personalised feedback, and instructors may struggle to adapt their teaching methods to the online format. Regarding the benefit of repeating courses without embarrassment, it's crucial to consider that graduates may feel less accountable for their learning without direct instructor supervision. Online courses may lack the support systems and resources available in traditional classrooms. (Neelakantha & Sultana, 2022).

2.2.3 Linear Learning

Linear learning, also known as Computer-Based Training (CBT), is a type of educational technology where graduates receive programme content through their devices, such as computers, tablets, or smartphones (Kats, 2020). This approach presents information in a sequential, linear manner, often using multimedia elements like text, images, videos, and quizzes to engage learners. Linear learning simply means that the course material is divided into several steps - chapters, modules, and videos that are offered in a fixed order. It looks much like reading an online manual or book. It is frequently used in teaching static processes, like using software or completing mathematical equations. The training is web-based training (sent over the Internet using a web browser). Linear learning is facilitated by various technologies, including Learning Management Systems (LMS) like Canvas, Blackboard, and Moodle, which enable instructors to create and organise course content into sequential modules. E-learning authoring tools like Articulate Storyline, Adobe Captivate, and Lectora Inspire, allow instructors to create interactive modules, videos, and quizzes. Online course platforms like Udemy, Coursera, and edX, host and deliver linear learning content. Web-based training tools like Litmos, Talent LMS, and eLogic Learning, offer features like course creation, assessment, and tracking. Video hosting platforms like YouTube, Vimeo, and Wistia, enable instructors to share video content. Screen recording software like Camtasia, Snagit, and OBS Studio, allows instructors to create tutorial videos. Interactive simulation tools like Adobe Captivate, Articulate Storyline, and SmartBuilder, enable instructors to create hands-on learning experiences (Kats, 2020).

CBT is different from traditional learning as there is no classroom, textbooks, or manuals. Instead, videos and animation can be included in CBT which will help graduates understand the topics more precisely. Furthermore, with the help of Computer-Based Training, assessments such as multiple-choice questions, drag-and-drop, and others can be stored easily and recorded using online software and providing feedback/results simultaneously to users.

Lastly, users can get the results online in the form of a certificate. However, there are some challenges; creating the required CBTs requires significant resources. Sometimes, the CBT may be complex to use. Also, there is no interaction between students and teachers, resulting in no exchange of thoughts and knowledge. Some examples of CBT are training people in how to operate heavy equipment (e.g., cranes) and vehicles (e.g., aircraft) or how to work safely in hazardous environments (e.g., oil rigs) (Coelhoso & Kalogeras, 2024).

2.2.4 Blended Learning

According to Hrastinski (2019), blended learning is an instructional approach that combines online digital learning with traditional face-to-face classroom methods. It integrates technology and digital resources into the learning process, allowing for a more flexible and personalised educational experience. Blended learning is a type of educational technology in which graduates receive part of their instruction in a traditional classroom setting and part of their instruction online. This type of learning is often used for classes that require both hands-on and online learning, such as science labs or history projects. Blended learning can be done in person or online, and it often includes tools like video conferencing, discussion boards, and wikis. The benefits of such learning are as follows: it combines the best of both worlds; hands-on and online learning, can be used for classes that require both hands-on and online learning, such as science labs or history projects and can be done in person or online. However, there are also drawbacks which include that it may be more expensive than traditional learning since it requires a reliable internet connection and teachers may need to be trained on how to use EdTech tools (Ozogur, Erturk, and AYDIN, 2024). Technologies that allow for hands-on and online learning include:

1. Virtual lab platforms (Lee,2020).

2. Online project management tools (Pierson, 2019).

3. 3D printing and modeling software (e.g., Autodesk, Fusion 360 &Hsieh (2019).

4. Virtual and augmented reality (VR/AR) tools: Space, Google Expeditions (Lee, 2020).

5. Online collaboration platforms: Slack, Microsoft Teams (Pierson, 2019).

6. Digital tools for data analysis and visualization: Tableau, Power BI (Brown, 2020).

7. Online resources and libraries (e.g., NASA STEM Resources, National Archives Pierson, 2019).

These technologies are utilised to conduct virtual labs and experiments, manage and collaborate on projects, create and manipulate 3D models, experience immersive VR/AR environments, facilitate online collaboration and communication, analyse and visualise data and access online resources and libraries.

To address these drawbacks, educators can explore cost-effective solutions and grants, develop technical support and training, integrate technologies in a way that complements traditional learning and assess and address student needs and learning styles.

2.2.5 Collaborative Learning

According to Maxfield (2018), collaborative means 'to work with another person or group to achieve or do something, so collaborative learning is how learning is done in groups by working together.' Problem-solving, learning new concepts or completing tasks are provided in groups of two or more to work together. In this way, individuals can learn through collecting data and listening to others' thoughts rather than simply learning the provided resources. This way, they are dependent on teachers (the primary source of skills and knowledge) (Maxfield, 2018). Linking to this study, educational technology enables graduates to work together more effectively, regardless of geographical constraints. Technology allows for tailored learning experiences, catering for individual needs and learning styles. Educational technology provides access to a vast array of educational resources, including online tutorials, videos, and interactive simulations. Technology integration in education offers numerous benefits, including the creation of virtual labs and simulations that make complex concepts more accessible and interactive (National Academy of Sciences, 2020). Educational technology can also aid teachers in lesson planning, grading, and providing feedback (International Journal of Educational Technology, 2022). Moreover, technology enables education to reach a wider audience, including remote or underserved populations (UNESCO, 2020). Additionally, it can reduce costs associated with traditional teaching methods (Brookings Institution, 2019). By adopting educational technology, we can prepare graduates for a technology-driven world (World Economic Forum, 2020). Emphasising educational technology adoption can lead to a more collaborative, personalised, and effective learning environment, ultimately resulting in better educational outcomes (OECD, 2020).

The advent of educational technology has revolutionised the learning landscape, and this has enabled individuals to access knowledge from anywhere, beyond the confines of traditional classrooms (UNESCO, 2020). With the proliferation of digital resources, learners are no longer solely dependent on teachers for knowledge acquisition but can explore diverse sources and develop critical thinking skills through the process of discovery learning. The past few years have witnessed significant advancements in educational technology, offering a wide range of innovative tools and platforms that can be seamlessly integrated into the classroom. As a result, educational technology has become an indispensable component of modern education, fostering a more inclusive, flexible, and student-centred learning environment (World Economic Forum, 2020). Each type of technology has its benefits and drawbacks, so it is important to choose the right type of technology for each class. When choosing technology for vocational training, consider factors such as alignment with learning objectives, student needs and skills, technical requirements and support, cost and ROI, flexibility and adaptability and potential for integration with existing tools and resources. By carefully selecting the right technology for each class, vocational training programmes can enhance the learning experience and improve student outcomes.

2.3 Factors influencing technology adoption among adult learning in Vocational Training Centres

Factors influencing technology adoption include participant and institutional characteristics that may have an impact on learner achievement in technology in VTCs.

2.3.1 Participant-level factors

Three classes of participant-level variables examined include: demographics, computer skills, and motivation. Participant demographics are important to collect and analyse to understand the differences between student groups (Vandenberg et al., 2020). Especially in computer-related technology courses, research has shown that males and females differ in their interest and ability in the subject matter (Knezek & Christensen, 2020; Wang et al., 2020). The mentioned authorities provide insights into the three classes of participant-level variables: demographics, computer skills, and motivation. Here is an interpretation and analysis of the ideas from some authorities:

2.3.1.1 Participant Demographics: Research emphasises the importance of collecting and analysing participant demographics to understand differences between student groups (Hernández et al., 2022). Demographic information such as gender, age, ethnicity, socioeconomic status, and other relevant factors can provide valuable insights into how these factors may influence educational outcomes (Hussar & Bailey, 2014). Understanding demographic differences can help educators and researchers tailor instructional approaches and support systems to meet the specific needs of diverse student populations (Ladson-Billings, 2022).

Xu et al., (2020) emphasise the importance of collecting and analysing participant demographics to understand differences between student groups. Demographic information such as gender, age, ethnicity, and socioeconomic status can provide valuable insights into how these factors may influence educational outcomes. Understanding demographic differences can help educators and researchers tailor instructional approaches and support systems to meet the specific needs of diverse student populations.

1. Gender:

- Female graduates are more likely to use technology for collaborative learning, while male graduates prefer technology for individualised learning (Huang, 2019).

- Women are underrepresented in STEM fields, but technology can help bridge the gap (Hodges et al., 2020).

2. Age:

- Younger graduates (Gen Z) are more comfortable with technology and prefer digital learning materials (Seemiller, 2019).

- Older graduates (Millennials) may need more training and support to adopt new technologies (Gissy, 2018).

3. Ethnicity:

- Minority graduates (e.g., African-American, Latino) may face barriers in accessing technology, leading to a digital divide (Hoffman, 2016).

- Culturally responsive teaching with technology can improve educational outcomes for minority graduates (Gay, 2018).

4. Socioeconomic Status (SES):

- Graduates from lower SES backgrounds may have limited access to technology, internet, and digital resources (Knezek, 2018).

- Technology can help bridge the gap for graduates from low-SES backgrounds but requires equitable access and support (Wong, 2020).

Computer Skills: Recent studies such as Wang et al., (2020) and Singh et al., (2019) indicate that, in computer-related technology courses, males and females have similar levels of computer skills and interests. However, females may be underrepresented in certain areas like programming and game development (Vakil, 2020). Additionally, research by Gao et al., (2020) suggests that gender differences in computer skills may be decreasing as technology becomes more integrated into daily life. It is important to address this gap by promoting equal opportunities and providing support to ensure that both male and female graduates have access to quality technology education and the necessary skills to succeed in the field to address the gender gap in technology education and promote equal opportunities, the following strategies can be implemented: By implementing these strategies, one can promote equal opportunities and support both male and female graduates in accessing quality technology education and acquiring the necessary skills to succeed in the field.

2.3.1.2 Motivation***:*** While the authorities consulted do not specifically address motivation, it is acknowledged as one of the classes of participant-level variables. Motivation plays a crucial role in educational outcomes. Recent research emphasises the crucial role of motivation in academic performance. For instance, studies by Hidi and Renninger (2019) and Durik et al., (2017) highlight the significance of interest and motivation in driving student engagement and achievement.

Moreover, contemporary research underscores the importance of self-efficacy and the expectancy of success in shaping academic outcomes (Bandura, 2019; Yeager et al., 2016). These factors influence graduates' willingness to take on challenges, persist through obstacles, and strive for excellence.

Analysing these ideas, it is evident that participant-level variables such as demographics, computer skills, and motivation can significantly impact educational outcomes. Recognising and addressing these factors can contribute to inclusive learning environments and supporting graduates in their educational journeys. Efforts should be made to bridge gender gaps in computer-related fields and foster motivation among learners, ensuring equal opportunities and promoting success for all graduates.

Participant-level variables, such as demographics, computer skills, and motivation, play a crucial role in shaping educational outcomes. To create inclusive learning environments, it's essential to recognise and address these factors.

A report by Chmelka et al., (2020), outlines a comprehensive approach to increasing diversity in computer-related fields, addressing disparities in gender and socioeconomic representation. To achieve this, implementing targeted outreach and support programmes can be ideal. This can be augmented by providing training and resources to develop computer literacy, fostering a growth mindset, and encouraging peer support, mentorship, and recognition. By implementing these strategies, educators can promote equal opportunities and success for all graduates, ultimately contributing to a more diverse and inclusive technology industry.

Due to cognitive development and the amount of academic and life experience at different ages (Turner et al., 2020), older learners are expected to perform better than younger learners. Two demographic factors are age and job status. Age is an important factor that may influence an adult learner’s achievement. At the college level, prior research suggests that graduates with full-time jobs tend to academically achieve less than graduates with part-time jobs or no jobs (Wiese-Bjornstal, 2018). This may be due to the increased time commitment and stress associated with full-time work, which can impact academic performance (Wang et al., 2020; Al-Shammari et al., 2019; Hassan et al., 2018).

Motivation is the third set of participant-level factors that were considered. An individual's beliefs, goals, and expectations are directly related to levels of engagement or disengagement in learning. Graduates who are more motivated to learn and have a stronger belief in their ability to succeed tend to perform better academically (Hidi & Renninger, 2019). This highlights the importance of fostering a growth mindset and promoting intrinsic motivation in learners. Long-term goals are also important. A participant's career goal is one example of a long-term goal. Graduates who have clear career goals aligned with their educational programme tend to exhibit higher levels of motivation and academic performance compared to those who are uncertain about their career paths (Tonyan & Risen, 2018). A participant's desire for lifelong learning may also influence motivation and academic achievement. Adult learners who embrace a growth mindset and are enthusiastic about lifelong learning tend to exhibit greater persistence, self-direction, and self-confidence (Sandars et al., 2020). Additionally, they employ effective cognitive strategies to maximise their learning outcomes (Kostons, 2019). The interplay between motivation and engagement has been widely recognised as a crucial determinant of individual achievement. Extant research has consistently demonstrated that graduates who exhibit higher levels of motivation and engagement tend to achieve greater academic success (Hidi & Renninger, 2019). This is because motivation and engagement are critical precursors to the development of adaptive learning strategies, persistence, and resilience. Moreover, motivation and engagement can be fostered through the creation of supportive learning environments, autonomy support, and the provision of meaningful learning activities (Deci & Ryan, 2019).

Furthermore, the relationship between motivation, engagement, and achievement is complex and bidirectional. Conversely, a lack of motivation and engagement can lead to decreased achievement, perpetuating a cycle of disengagement and under achievement. The value placed on learning and the expectancy of success are crucial factors that influence academic achievement. Research has shown that individuals who attribute higher value to learning and have greater confidence in their ability to succeed tend to perform better academically (Hidi & Renninger, 2019). This is because they are more likely to be intrinsically motivated, engage in deeper learning strategies, and persist in the face of challenges. In contrast, those who lack confidence or do not see the value in learning may struggle to achieve academic success.

Additionally, the expectancy of success plays a critical role in shaping academic outcomes. When individuals believe they can succeed, they are more likely to take risks, ask questions, and seek help, leading to increased learning and achievement (Bandura, 2019). Conversely, a low expectancy of success can lead to decreased motivation, disengagement, and poor academic performance. The significance of long-term goals, particularly career aspirations, cannot be overstated. Research has shown that individuals who have clearly defined career goals aligned with their educational programme tend to exhibit higher levels of motivation, engagement, and academic achievement (Tonyan & Risen, 2018). This is because career goals catalyse focused effort, directed learning, and sustained persistence. In contrast, individuals who lack clear career goals or are uncertain about their career paths may struggle to find meaning and purpose in their academic pursuits, leading to decreased motivation and performance.

In the context of this study, the importance of long-term goals is particularly relevant. Participants who have selected a career closely related to their educational programme are more likely to be motivated to learn and achieve academic success. This highlights the need for educational programmes to provide career guidance and support to help participants clarify their career aspirations and align them with their academic pursuits.

2.3.2 Institutional level factors

Vocational training programmes are offered in various institutions, including high schools, community colleges, universities, career centres, and non-traditional settings like homeless shelters. Adult learners can register for courses in these institutions, which must meet minimum standards to offer vocational training (Odanga et al., 2021). However, differences in technical and instructional resources between institutions may impact learner achievement. The geographical location of an institution, whether urban, suburban, small town or rural, can also affect success due to varying organisational and social environments and resources (Barker, 2020; Hannaway & Talbert, 2020; Lee & McIntire, 2020). Research suggests that educational inequities in urban areas may lead to achievement gaps between participants in these institutions and their peers in suburban and rural institutions (Kozol, 2020; Lee, 2020; Bracey, 2020; Verstegen et al., 2019; Walberg, 2020). Being in a financially disadvantaged region may impact performance, with traditional learners in these areas expected to perform lower than their peers

in more developed regions. Graduates from institutions in economically disadvantaged regions may achieve less than their peers in other regions.

Kemei et al., (2018) interrogated the determinants of effective implementation of quality vocational training programmes and the challenges affecting implementing a technical curriculum in public vocational training institutions in Kenya. The paper asserts that investing in education is a potent means that could be explored to fast-track technological progress, and economic growth, and boost citizens' capacities. This was to improve the quality of the vocational training institutions' quality, making the graduates marketable and in tandem with industrial needs.

In a nutshell, student factors such as low reading culture, graduates' peer group influence, student's practice of examination malpractice and student's irregular attendance affect their performance. Students' interest in learning, their parents' backgrounds, students' disobedience to school regulations and rules, and lack of required learning material such as textbooks affect the quality of vocational training programmes. The other primary factors affecting the quality of vocational training programmes are the lecturer's competencies, teaching methods employed by the lecturers, lecturer' syllabus coverage, lecturer punctuality to class, and appropriateness of the teaching methods used by the lecturers.

2.4 The attitudes of adult learners towards modern educational technology.

According to recent research, an attitude is a favourable or unfavourable condition of something (Ching & Premlata, 2014). Graduates' attitude refers to their, perceptions, beliefs, reasons, imaginations, and wills (Mawi & Maisnam, 2020). The role of graduates' attitudes in the implementation of technology in learning is significant, as it can either support or hinder the development of learning programmes and their proliferation (Singh & Kumar, 2020). A positive attitude towards technology can lead to increased adoption and effective use, while a negative attitude can lead to resistance and rejection (Kaur & Singh, 2020). Therefore, understanding graduates' attitudes towards technology is crucial for the successful integration of technology into learning (Sharma & Gandhi, 2020).

The effect of information technology on human life is immense and its role in education too cannot be underrated. In the current scenario of the COVID-19 pandemic, the contribution of information technology has gained momentum due to the closure of educational institutions raising challenges for graduates' learning (Schildkamp et al., 2020; José, et., al 2023). During this quarantine time information technology served as the solution for the ongoing learning process through innovative and learning management systems (Etemadifar et al., 2022; Muzaffar, 2020; Zayabalaradjane, 2020). It provided an opportunity for educators to implement information technology solutions for teaching as well as evaluation for the completion of coursework of graduates. The efforts of stakeholders namely teachers, graduates and institutional administrators were on for the optimal use of the technology and efficient learning process (Henderson, 2020). The goal was to minimise the learning gap that arose due to the lockdown. Educational institutions and graduates across the world had accepted and appreciated the online platform of learning. The reasons for this acceptance were ease of use, learning flexibility and controllable environment. However, despite its multiple advantages there were a few limitations of e-learning such as social isolation, face-to-face interaction between teacher and student as well as connectivity issues, etc. (Serpa, 2020).

E-learning had never been adopted and accepted as real learning or the formal mode of education before the pandemic. During the pandemic, most educational institutions were exploring e-learning to make it easy for students to work in the new normal. Also, various e-teaching software were explored by teachers or educators to enable ease of learning for their students (Nassoura, 2020). As a matter of fact, as this e-learning wave was a new development, teachers as well as students were in the process of adapting this new teaching and learning methodology. In the current prevailing situation of virtual teaching and setting of the new normal of teaching-learning methodology, it becomes more important to get to know the opinion of learners and to explore learners' inclination towards this novel teaching methodology, such as their degree of adaptation and amendment if any they would like to suggest for the same or want to reject it altogether (Bali, 2018). Against such a backdrop, this study aimed to examine the perception of e-learning during the COVID-19 lockdown period. During the pandemic research on exploring graduates' perception and their expectations from e-learning was prevalent Basto et al., 2020; Biswas, 2020). Several studies indicated that most of the graduates enrolled in online courses were satisfied with the mode of learning. However, studies also revealed that the perceptions of

learners were affected by a host of other factors (Salloum, 2019; Pérez-Pérez, Serrano-Bedia & García-Piqueres, 2020).

Factors such as age, gender, prior knowledge of computer literacy, and learning styles of individuals are vital predictors of technology acceptance by students (Al Kurdi et al., 2020). Theories of "technology acceptance" have been extensively discussed in the literature to study graduates' perceptions (Al Kurdi et al., 2020). Recent studies (Green, 2020; Hannon, 2020; Kvavik, 2020; Salaway et al., 2020) in the United States, United Kingdom, and other countries confirm that a majority of learners possess their own internet-enabled devices, such as personal computers and mobile phones, and they utilise them for communication on formal and informal networking platforms like emails, blogging, and social media (Kaur et al., 2020; Singh et al., 2020).

Relevant literature is consulted to find possible answers, particularly in the area of users' perception towards innovation. The "Theory of Diffusion of Innovations" (Rogers, 2003; Quinlan and Kobin, 2023; Cox, 2023) remains one of the most relevant theories for studying technology adoption in higher education. Rogers (2003) states that users' perception of an innovation significantly affects its adoption. The perception of relative advantage is a crucial factor, referring to the extent individuals perceive an innovation as better than existing products or methods. When considering adoption, individuals assess potential benefits, advantages, and improvements over existing alternatives. The perception of relative advantage can be influenced by factors such as increased efficiency, cost-effectiveness, improved performance, convenience, or other desirable features. If individuals perceive significant advantages, they are more likely to adopt the innovation (Kaur et al., 2020; Singh et al., 2020).

Compatibility refers to the degree of consistency between innovation and the existing values, beliefs, needs, and experiences of the individuals or the adopting system. Compatibility refers to how well the innovation aligns with the current practices, infrastructure, and goals of the adopters. If an innovation is seen as compatible with the existing setup, it is more likely to be adopted. Compatibility can be assessed in terms of technical compatibility (fitting with existing systems and technologies), cultural compatibility (congruence with organisational or societal values and norms), and task compatibility (alignment with the tasks and requirements of the

users). When an innovation is perceived as compatible, it reduces the perceived disruption and increases the likelihood of adoption. According to the "Technology Acceptance Model", the two most important determining factors for technology acceptance are perceived usefulness and perceived ease of use (Mlekus, et al., 2020). This study explored the relationships among course structure/organisation, learner interaction, student engagement, and instructor presence on student satisfaction and perceived learning in online learning environments.

Online learning had attracted attention over the last several years, and effective online literacy was increasing in a cautious instructional system (Hodges et al., 2020). Nevertheless, owing to the COVID-19 situation, many graduates worldwide had to transfer from physical classes to online classes in the middle of the semester. The outcome may negatively influence the graduates' learning performance if they lacked self-confidence in the educational technology they were applying, (Khan et al., 2022). Similarly, the more effective transitions to online classes were affected by the graduates' acceptance level of the educational technology (Aguilera-Hermida, 2020; Kemp et al., 2019; Yakubu & Dasuki, 2019). Consequently, it was essential to study the factors relevant to the educational technology acceptance model in terms of the COVID-19 lockdown situation.

2.5 The influence of Teachers' competencies on Vocational Training Information and Communication Technology (ICT) implementation.

Information and Communication Technology (ICT) significantly influences all domains of human life (Gnambs, 2021). Similarly, ICT has also transformed the education sector and turned instructional practices into more interactive and productive activities (Lin et al., 2017), as it offered various tools which are used in traditional as well as online teaching spaces and assisted in building a proactive classroom environment (Jogezai et al., 2021).

Technology-incorporated instructional practices do not only enhance the quality of teaching (Akram et al., 2021a) but also enable students from various vocational training centres worldwide to develop their skills, boost their motivation, and enhance their knowledge and information efficiently (Chen et al., 2018). During the COVID-19 global crisis, when the entire world's activities across all domains of human lives got restricted, ICT played a supporting role in sustaining teaching-learning activities on the one hand (Thaheem et al., 2021). While on the

other hand, ICT-integrated teaching and learning provided a flexible approach and better access to learning opportunities as a substitute for face-to-face instruction (Akram et al., 2021a.) However, teachers faced difficulties in making the best use of ICT in their instructional practices due to inadequate technological competencies, yet the transitory phase improved their digital skills.

Furthermore, the utilisation of ICT in education for enhancing instructional practices had been considered crucial for the last few decades worldwide (U.S. Department of Education, 2017). Several studies also highlighted the significance of ICT-integrated instructional approaches in meeting the educational needs of the learners by increasing their thoughtfulness and keeping graduates motivated, which was viewed as a significant predictor of graduates' educational growth (Xu et al., 2021). Liu et al., (2022) project that technology-integrated learning increases the cognitive understanding and learning achievements of graduates. In addition, ICT incorporated teaching-learning practices also enable learners to stay connected with their instructors and peers (via various social media platforms), help graduates resolve their academic challenges and keep them participating actively in learning activities (Liu et al., 2021). Recognising the importance of graduates' active involvement in the learning activities, Liu. et al., (2021) also suggested that teachers should design collaborative activities via the computer-supported collaborative concept mapping (CSCCM) technique to develop a collaborative classroom environment, which also enhances graduates' interest. To put it briefly, ICT-integrated teaching-learning is the requirement of time, which allows the learners to satisfy their learning needs and helps teachers align their teaching approaches with global standards (Akoka et al., 2023).

Correspondingly, Pakistan also recognised the importance of ICT in education, and the national educational policies proved that the Pakistan government had special concerns about integrating ICT into teaching-learning practices to meet global needs (Pakistan Ministry of Education, 2018). However, there were many factors in developing countries, including Pakistan, such as; lack of ICT infrastructure (Akram et al., 2021a), electricity and internet (Akram et al., 2021b), technological knowledge and expertise (Asad et al., 2020), and lack of teacher training in educational institutions (Abbasi et al., 2021), that badly affected the successful deployment of ICT in classrooms. Apart from above mentioned technology-related factors, teachers'

perceptions and beliefs played an important role in effective technology integration. Their beliefs defined their pedagogical decisions on how to integrate technology within their instructional practices that supported the teaching and learning needs of the twenty-first century (Tondeur et al., 2017).

Previous studies have also identified that teachers' instructional practices were affected by their pedagogical beliefs (Taimalu & Luik, 2019). Teachers preferred the technological applications that aligned with their pedagogical strategies and existing beliefs about teaching and learning. In other words, technology use was associated with teachers' perspectives regarding the nature of teaching and learning in a classroom. Taking this into account, innovative educational strategies suggest that technology integration could only be comprehended well when teachers' perspectives regarding technology use were taken into consideration (Watson & Rockinson-Szapkiw, 2021). In this regard, this study investigated teachers' perceptions regarding their willingness, attitudes, and challenges they encountered while integrating ICT into their teaching-learning practices. By establishing teachers' experiences and perceptions, this study would help teachers make best use of ICT in teaching and learning activities by sorting out challenges and assisting concerned authorities in formulating policies accordingly.

Vocational training programmes are an important part of an educational system in many countries, though their successes are not uniform, partly due to attitudes by learners towards educational technology. There is evidence that educational technologies can be used as cost-effective teaching tools, if learners have a positive attitude.

2.5.1 Teachers' Competencies

Teachers need confidence, skills, and capabilities in using ICT for instructional purposes to perform the task appropriately (Jordan et al., 2019). Teachers' competency is a vital requirement to implement ICT in teaching and learning. Emiliani et al., (2020), established that the lack of confidence in using ICT in instruction is caused by inadequate knowledge of ICT-related tasks and deficient skills in using ICT software tools and appliances. Brown et al., (2019) reiterate that capacity building in education on ICT use should concentrate on offering multimedia modules borderless training strategy and in-service training using ICT. Therefore, the instructors should be equipped and furnished with relevant knowledge and skills to become more agreeable with

technology, the Internet, web design, and project-based approaches to education. All this is geared towards equipping instructors to employ ICT in subject teaching, familiarising ICT tools, and specialising in usage patterns. Similarly, Wolff et al., (2020) reiterate that skills and knowledge, if not addressed appropriately, could inhibit the effectiveness of ICT use in teaching and learning.

Further, Xue and Churchill (2020) posit that there has been a meaningful improvement in teachers' awareness and transformation of classroom activities after training geared towards educational practices and strategies on ICT application. The findings are consistent with Zha et al., (2020) who deduced that instructors with limited ICT training are authoritarian and inefficient, making learning difficult for learners as they view school as being repressive. Similarly, research has established that routine use of ICT through teachers' professional development and instruction process correlates with high-level learners' ICT related skills and experience. Further, teachers' inefficient ICT skills and knowledge affect their performance in their institutions. Hofer et al., (2021) established that teachers who lack ICT skills and knowledge do not integrate ICT into teaching and learning. This makes integration and implementation of ICT a difficult task since instructors with limited experience in ICT fear using them as claimed by Yang and Lam (2021).

Teachers' competencies are the key predictor in ICT implementation. Mabrouk et al., (2018) established the correlation between teachers' competencies and their confidence.Teachers' confidence was related to their perception of ICT tools in the classroom. Similarly, teachers' ICT competencies were related to their qualifications; therefore, academic qualifications influence ICT implementation. Molteni et al., (2019) established that individuals with lower educational qualifications use ICT tools rarely for various purposes in both developing and developed countries. Marcinkiewicz-Wilk and Jurczyk-Romanowska (2018) showed that computer competence is related to computer use among university lecturers in the United States of America. They, therefore, concluded that computing confidence greatly influenced university preparedness for ICT implementation. Further, (2021) established that ICT competence was fundamental to ICT implementation by lecturers in teaching and learning. Therefore, ICT competence by lecturers influenced ICT implementation in the university since lecturers are the crucial element in enhancing an institution's capacity to embrace ICT.

2.5.2 ICT Implementation

Information and Communication Technology (ICT) implementation involves the choices and decisions of an individual or a learning institution to adopt a particular technological innovation (Buabeng-Andoh, 2021). The implementation consists of the adoption of all necessary procedures to use the technology (Khan & Jawaid, 2020). Generally, the process should be complete, where all the critical components are put together to make a whole (Davies et al., 2019). The ICT implementation procedure uses research tools, evaluation procedures, organisation, and information communication (Sifakis et al., 2018). Further, in universities, teaching and learning ICT tools for research and the Internet are widely used (Pan et al., 2020). Similarly, other tools like computers, projectors, audio-visual technologies are used extensively for teaching and learning in universities (Bariu, 2020).

Information Communication Technology (ICT) implementation involves the adoption and use of specific technological innovations by individuals or educational institutions. ICT covers all technical means used to handle information and aid communication. This includes both computer and network hardware, as well as their software.

To facilitate ICT implementation, various research tools, evaluation procedures, organisational strategies, and communication methods are employed. These tools and processes aid in the successful integration of ICT into teaching and learning practices. In the context of universities, ICT implementation often involves the widespread use of teaching and learning tools such as research resources, internet connectivity, computers, projectors, and audio-visual technologies. These tools contribute to enhancing the educational experience and supporting various instructional activities within universities.

The ideas presented above are based on the works of several authorities in the field. Buabeng-Andoh (2021) emphasises that ICT implementation involves the adoption of technological innovations, while Khan and Jawaid (2020) emphasise the importance of following necessary procedures. Davies et al., (2019) stress the need for a complete process that brings together critical components. Sifakis et al., (2018) mention the use of research tools, evaluation procedures, organisation, and communication in ICT implementation. Pan et al., (2020) highlight the use of teaching and learning tools like research resources and the Internet in universities.

Bariu (2020) mentions the application of computers, projectors, and audio-visual technology for teaching and learning purposes in universities. By drawing upon these authoritative sources, the concept of ICT implementation and the various tools and strategies involved in successfully integrating technology into educational settings are better understood.

Studies on teachers by Garcia et al., (2021) in Spain, established that 85% had inadequate skills to implement ICT effectively in teaching and learning. Thus, skills competence was regarded as the critical factor limiting ICT implementation in instruction. Similarly, a study by Selim et al., (2020) on teachers' acceptance of ICT integration in teaching established that skill inadequacy contributed to reduced confidence in using ICT technology in universities in Malaysia. Further, Agboola et al., (2019) investigated the preparedness of university lecturers for the introduction of ICT at the International Islamic University of Malaysia and established that confidence and training in ICT were a significant predictor of ICT implementation. Thus, the relationship implied that trained lecturers exhibited substantial levels of preparedness and demonstrated confidence in integrating ICT. The study further investigated the impacts of background factors such as gender, age, and experience and established that ICT implementation had a weaker correlation with these; thus, they were not significant.

The studies conducted by Garcia et al., (2020), Selim et al., (2020), and Agboola et al., (2019) shed light on the importance of teachers' skills and competencies in implementing ICT effectively in education. These studies highlight the following key points: Inadequate skills as a limiting factor: Garcia et al., (2020) found that a majority of teachers (85%) had inadequate skills to implement ICT effectively in teaching and learning. This lack of skill competence was identified as a critical factor that hindered the successful integration of ICT in instruction. Selim et al., (2020) also observed that skill inadequacy contributed to low confidence in using ICT technology among teachers, thus influencing ICT implementation in universities in Malaysia.

Skills, competence and confidence: Agboola et al., (2019) investigated the preparedness of university lecturers for ICT integration and found that confidence and training in ICT were significant predictors of ICT implementation. The study revealed that trained lecturers exhibited higher levels of preparedness and demonstrated confidence in integrating ICT into their teaching practices.

Background factors and ICT implementation: Agboola et al., (2019) examined the impact of background factors such as gender, age, and experience on ICT implementation. The study found that these factors had a weaker correlation with ICT implementation, suggesting that they were not significant predictors. This implies that regardless of gender, age, or experience, teachers' confidence and training in ICT play a more crucial role in determining their readiness to integrate technology effectively.

These findings emphasize the importance of providing teachers with adequate training and support to enhance their ICT skills and confidence. To develop a framework for enhancing educational technology in vocational training centres, it is crucial to address the skills gaps among teachers and provide targeted professional development programmes that focus on building their competence in using ICT tools and resources. The framework should also consider the unique needs and challenges of vocational training contexts and provide ongoing support mechanisms to ensure sustained integration of ICT in instruction.

Studies by Wu et al., (2019) investigated the factors influencing ICT website adoption in universities. They established that intention to use ICT websites was greatly influenced by the relative advantage of the website, compatibility of the technology, and prior experience in ICT use. Further, lecturers' use of ICT websites was greatly influenced by their competence in using the technological tools. Therefore, ICT-competent lecturers exemplified quick accessibility of ICT websites, unlike the incompetent teachers who had challenges. However, the study alluded to the affordability and accessibility of ICT infrastructure; therefore, it may not have been applicable in developing countries. Further, Konovalova et al. (2021) investigated the factors influencing e-learning at a university in Bahrain. The study was premised on the Technology Acceptance Model (TAM), which established that perceived usefulness and ease of use significantly influenced lecturers' use of ICT in teaching.

Further, the findings demonstrated that computer self-efficacy significantly influenced accepting ICT technology. Therefore, the study was necessary to improve the ICT skills and knowledge of the teachers because they greatly influence the ICT perception of both their graduates and university management. However, the Technology Acceptance Model (TAM) applied in the

study was weak in that it did not consider the socioeconomic and cultural factors that determine an individual's technology use (Fox, 2019).

The findings of the study indicated that computer self-efficacy, which refers to an individual's belief in their ability to use computers effectively, had a significant impact on the acceptance of ICT. This suggests that teachers' level of self-efficacy in using computers and ICT tools is an important factor influencing their perception and acceptance of educational technology. Consequently, the study emphasized the need to enhance teachers' ICT skills and knowledge to positively influence the perception and acceptance of ICT technology by both graduates and university management.

However, the study also identified a limitation in the application of the Technology Acceptance Model (TAM). The TAM is a widely used theoretical framework that examines the factors influencing individuals' acceptance and adoption of technology. The criticism raised by Fox (2019) is that the TAM does not adequately consider socioeconomic and cultural factors that can shape an individual's orientation towards technology use. These factors, such as access to technology, digital literacy levels, cultural norms, and economic resources, can greatly influence how individuals perceive and engage with educational technology.

In the context of developing a framework for enhancing educational technology in vocational training centres, it is important to consider the socioeconomic and cultural factors that may influence the acceptance and adoption of technology by both teachers and graduates. The framework should consider the diverse backgrounds, needs, and resources of learners and provide support and resources that are inclusive and accessible to all. This may involve addressing issues of digital equity, providing training and support tailored to different levels of digital literacy, and considering cultural sensitivities and preferences in the design and implementation of educational technology initiatives. By addressing these socioeconomic and cultural factors, the framework could promote a more holistic and inclusive approach to enhancing educational technology in vocational training centres, ensuring that technology initiatives are effective, equitable, and responsive to the needs and contexts of the learners and the educational institutions.

Sobieraj and Krämer (2020) investigated the role of gender and social influence in technology acceptance behaviour among the academic staff of public universities. They established that men accepted the new technology more than women. Similarly, younger teachers were more interested in new technology than the older lecturers. The findings implied that younger teachers were open to new ideas, unlike more senior teachers who were afraid of new technologies and considered them a threat to their careers.

Kalla et al., (2019) investigated the factors influencing teachers' computer use in the classroom in selected commonwealth Virginia schools, in the United States of America. The study established that personal belief in ICT competence significantly predicted ICT use to support learning. The findings further reiterated that lecturers' competence greatly influences ICT use in teaching and learning. Similarly, Knezek et al., (2019) investigated the impact of new ICTs on lecturers' function and performance. The study applied an alternative hypothesis that high-level ICT skills result in higher technology integration, thus positively impacting graduates' achievements. Therefore, the model implied that teachers with higher skills easily influenced their institutions to integrate ICT technology in teaching and learning.

Garousi et al., (2020) investigated teachers' attributes on computing skills in Ecuadorian public universities. They established that changing lecturers' negative attitudes is essential for improving competence in ICT implementation in universities. Therefore, for successful ICT implementation in universities, lecturers should possess a positive attitude toward ICT tools. The findings further concluded that lecturers could develop a positive attitude when comfortable and knowledgeable with the technology. Additionally, Law and Lynch's (2019) study on worldwide assessment of ICT integration established that inadequate ICT skills greatly influenced ICT implementation in teaching and learning, with lecturers' adequate knowledge and skills being the critical impediments to technology implementation in learning institutions. Therefore, there is a need for addressing the skill challenge among the teachers for efficient ICT implementation in universities.

Luan et al., (2020) investigated gender differences in ICT competencies among teachers and teaching staff at Universiti Putra, Malaysia. The study used different software tools such as spreadsheets, databases, presentations, electronic mail, World Wide Web, multimedia, and

virtual applications and assessed the differences in competencies among male and female lecturers. The findings established the fact that both female and male teachers had good skills in word processing and e-mailing tools. These results were attributed to frequent utilization of ICT materials, manuscript writing, and general communication. The findings indicated that female lecturers had competence in the use of many software tools in comparison to their male counterparts. For example, female teachers scored 85% against 64% for males in the insertion of texts in the word processing. Further, females scored higher than males in the application of e-mailing tools with 96% against males with 87%. The findings further established that overall, 64% of all the lectures had some computer competencies (Luan et al., 2020).

The study carried out by Luan et al., (2020) explored teachers' competencies in integrating education technology in lesson preparation. The paper is anchored in the professional standards for teachers, specifically, domains that focus on the positive use of ICT. The study revealed that the self-evaluation of novice teachers on their abilities is highly competent. Qualitative data exposed the different struggles in teacher preparations in instructional methodologies. Based on the study results, novice teachers lacked competencies related to online instructional preparations. However, it was also significant that teacher-education institutions would help prepare teachers to equip them with knowledge on integrating technology into lesson preparations. Teachers need time to develop a higher level of skill in applying various applications in their lessons. Public schools have limited ICT resources/infrastructures; they need to provide their own such as laptops and internet connectivity (Khalid et al., 2015; Nath, 2019).

The state of the education system the world over needs a more significant push and optimistic view that will be able to influence progressive change. Teachers should think of personal initiatives, welcome possible ways to enhance the current system and become part of reforms to help learners through the adoption of educational technology in vocational training centres to overcome and face challenges in the contemporary world.

2.6 Developing frameworks for Educational technology adoption

Several frameworks, as highlighted below, can be used to guide the adoption of educational technology.

2.6.1 TPACK Framework:

According to the TPACK framework, specific technological tools (hardware, software, applications, associated information literacy practices, etc.) are best used to instruct and guide students toward a better, more robust understanding of the subject matter. The three types of knowledge – TK, PK, and CK – are thus combined and recombined in various ways within the TPACK framework. Technology has become an increasingly important part of graduates' lives beyond school, and even within the classroom it can also help increase their understanding of complex concepts or encourage collaboration among peers. Because of these benefits, current educational practice suggests that teachers implement some form of technology in their classrooms – but many teachers face difficulties in doing so. Cost, access, and time often form considerable barriers to classroom implementation. nother obstacle is a lack of knowledge regarding how technology can best be used to benefit graduates across diverse subject matter.

The Technological Pedagogical Content Knowledge (TPACK) framework emphasizes the integration of technology, pedagogy, and content knowledge. It suggests that effective technology integration in education occurs when teachers have a deep understanding of how technology can enhance their pedagogical approaches and support the content they teach. The TPACK framework encourages educators to consider the intersection of these three knowledge domains when planning and implementing technology-rich lessons (Chai and Tan, 2024).

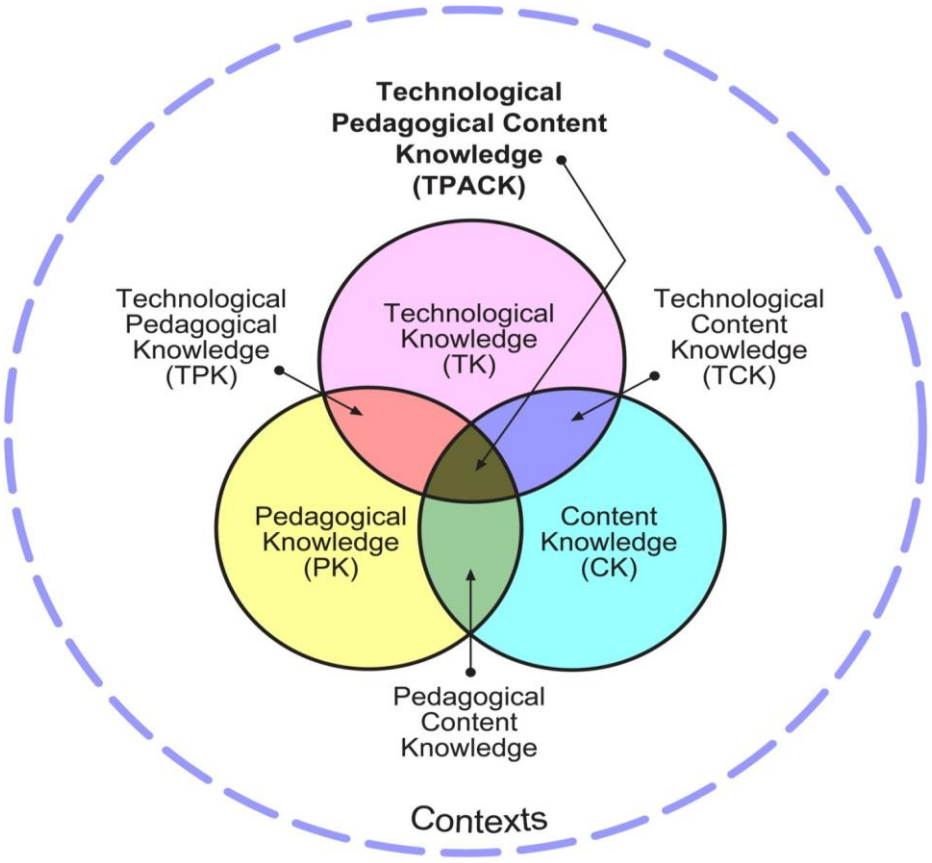


Figure 0.3: The T-Pack Framework (Mishra & Koehler, , 2006, p.1029)

This adaptability can be seen in the various intersections and relationships already embodied in the TPACK acronym.

2.6.1.1 Content Knowledge (CK) – This describes teachers' own knowledge of the subject matter (Ball, Hill & Schilling 2008). Content knowledge refers to the depth and breadth of knowledge and understanding that an individual possesses in a specific subject area or domain. It encompasses the factual information, concepts, theories, principles, and skills relevant to that particular field of study. CK may include knowledge of concepts, theories, evidence, and organisational frameworks within a particular subject matter; it may also include the field's best practices and established approaches to communicating this information to graduates. CK will also differ according to discipline and grade level – for example, middle-school science and history classes require less detail and scope than undergraduate or graduate courses, so their various instructors' CK may differ, or the CK that each class imparts to its graduates will differ.

2.6.1.2 Pedagogical Knowledge (PK) – This describes teachers' knowledge of the practices, processes, and methods regarding teaching and learning. As a generic form of knowledge, PK encompasses the purposes, values, and aims of education, and may apply to more specific areas including the understanding of student learning styles, classroom management skills, lesson planning, and assessments.

2.6.1.3 Technological Knowledge (TK) – This describes teachers' knowledge of, and ability to use, various technologies, technological tools, and associated resources. TK concerns understanding edu-tech, considering its possibilities for a specific subject area or classroom, learning to recognize when it will assist or impede learning, and continually learning and adapting to new technology offerings.

2.6.1.4 Pedagogical Content Knowledge (PCK) – This describes teachers' knowledge regarding foundational areas of teaching and learning, including curricula development, student assessment, and reporting results. PCK focuses on promoting learning and on tracing the links among pedagogy and its supportive practices (curriculum, assessment, etc.), and much like CK, will also differ according to grade level and subject matter. In all cases, though, PCK seeks to improve teaching practices by creating stronger connections between the content and the pedagogy used to communicate it.

2.6.1.5 Technological Content Knowledge (TCK) – This describes teachers' understanding of how technology and content can both influence and push against each other. TCK involves understanding how the subject matter can be communicated via different ed-tech offerings and considering which specific ed-tech tools might be best suited for specific subject matters or classrooms.

2.6.1.6 Technological Pedagogical Knowledge (TPK) – This describes teachers' understanding of how particular technologies can change both the teaching and learning experiences by introducing new pedagogical affordances and constraints. Another aspect of TPK concerns understanding how such tools can be deployed alongside pedagogy in ways that are appropriate to the discipline and the development of the lesson at hand.

2.6.1.7 TPACK framework - is the end result of these various combinations and interests, drawing from them – and from the three larger underlying areas of content, pedagogy, and technology – in order to create an effective basis for teaching using educational technology. In order for teachers to make effective use of the TPACK framework, they should be open to certain key ideas, including that concepts from the content being taught can be represented using technology,pedagogical techniques can communicate content in different ways using technology, different content concepts require different skill levels from graduates, and edu-tech can help address some of these requirements. Learners come into the classroom with different backgrounds – including prior educational experience and exposure to technology – and lessons utilizing ed-tech should account for this possibility. Educational technology can be used in tandem with graduates' existing knowledge, helping them either strengthen prior epistemologies or develop new ones.

By considering these aspects of the TPACK framework, this study can develop a comprehensive framework that takes into account the complex relationships between content, pedagogy, and technology in vocational training centres. This framework can help educators and administrators understand how to effectively integrate technology into their teaching practices, and how to support the development of skills and knowledge in their students. Additionally, the study explores how the TPACK framework can be used to address specific challenges and opportunities in Vocational Training Centres, such as:

- How to effectively integrate technology into existing curricula and teaching practices

- How to support teachers in developing their TPACK skills and knowledge

- How to address the diverse needs and backgrounds of students in vocational training centres.

- How to evaluate the effectiveness of technology integration in vocational training centres.

By linking the TPACK framework to this study, the research can provide a more comprehensive understanding of the complex factors that influence educational technology adoption in VTCs

and develop a framework that can be used to support effective technology integration and improve student learning outcomes.

2.6.2 ADDIE Model

The ADDIE instructional model first appeared in 1975 (Branson, 1975). It was created by the Centre for Educational Technology at Florida State University. The ADDIE model was further developed by Dick and Cary in 1978 and Russell Watson revised it in 1981, and it was considered essential in the development of educational and training programmes (Hannum, 2005). The ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model is a general instructional design framework that can be applied to the adoption of educational technology. It involves a systematic approach to developing and implementing technology-enhanced learning experiences. The model begins with an analysis phase to identify needs and goals, followed by a design phase to plan and create the learning materials. The development phase involves building and testing the technology-based solution, and the implementation phase focuses on deploying the technology in the learning environment. The evaluation phase assesses the effectiveness of the technology implementation and provides feedback for improvement.

2.6.2.1 Phase of E-content development

a) Analysis phase: The analysis phase is the foundation for all other phases of instructional design. During this phase, the investigator defines the problem, identifies the source of the problem and determines possible solutions. The phase may include specific research techniques such as need analysis, goal analysis and task analysis. The output of this phase often includes the instructional goals, and a list of tasks to be instructed. These outputs will be the inputs for the Design phase.

b) Design phase: The design phase involves using the outputs from the Analysis phase to plan a strategy for developing the instruction. During this phase, the investigator outlines how to reach the instructional goals determined during the Analysis phase and expand the instructional foundation. Some of the elements of the Design Phase may include identifying a target population, description, conducting a learning analysis, writing objectives and test items,

selecting a delivery system, and sequencing the instruction. The outputs of the Design phase will be the inputs for the development phase.

c) Development Phase: The Development phase builds on both the Analyse and Design phases. The purpose of this phase is to generate the lesson plans and lesson materials. During this phase the investigator constructs and develops the package with the help of media software and supporting documentation. This may include hardware (e.g, simulation equipment) and software (e.g, macromedia flash).

d) Implementation Phase: The implementation phase refers to the actual delivery of the instruction, whether it's classroom-based, lab-based, or computer-based. The purpose of this phase is the effective and efficient delivery of instruction. This phase must promote the graduates' understanding of material, support the graduates' mastery of objectives, and ensure the graduates' transfer of knowledge from the learning to setting the goals.

e) Evaluation Phase: This phase measures the effectiveness and efficiency of the instruction. Evaluation should actually occur throughout the entire instructional design process - within phases, between phases, and after implementation. Evaluation may be Formative or Summative. Formative Evaluation is ongoing during and between phases. The purpose of this type of evaluation is to improve the instruction before the final version is implemented. Summative evaluation usually occurs after the final version of instruction is implemented. This type of evaluation assesses the overall effectiveness of the instruction. Data from the summative evaluation is often used to decide the instruction (such as whether to purchase an instructional package or continue/discontinue instruction). This E-content method has been developed by the investigator to assess graduates' learning interactions, involvement and understanding of the lesson.

The ADDIE model is a comprehensive instructional design framework that can be applied to the development and implementation of educational technology. The five phases of the ADDIE model provide a systematic approach to creating effective technology-enhanced learning experiences. By following the ADDIE model, this study can develop a comprehensive and effective educational technology framework for VTCs, enhancing the learning experiences of students and instructors.

2.6.3 Rogers' Diffusion of Innovations (2003)

The Diffusion of Innovations Framework, developed by Everett Rogers, focuses on how innovations are adopted and spread within a social system. It identifies five categories of adopters: innovators, early adopters, early majority, late majority, and laggards. The framework emphasizes the importance of understanding the characteristics and needs of different adopter groups and tailoring the implementation strategies accordingly. It also highlights the role of communication, social influence, and the perceived relative advantage of the innovation in its adoption.

2.6.3.1 The Mechanism of Diffusion

According to Chiu (2017), diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Given that decisions are not authoritative or collective, each member of the social system faces his/her own innovation decision that follows a 5-step process:

1. Knowledge – the person becomes aware of an innovation and has some idea of how it functions,
2. Persuasion – a person forms a favorable or unfavourable attitude toward the innovation,
3. Decision – person engages in activities that lead to a choice to adopt or reject the innovation,
4. Implementation – a person puts an innovation into use,
5. Confirmation – a person evaluates the results of an innovation decision already made.

The most striking feature of diffusion theory is that, for most members of a social system, the innovation-decision depends heavily on the innovation decisions of the other members of the system. Empirically, the successful spread of an innovation follows an S-shaped curve as shown on the diagram above. There is, after about 10-25% of system members adopt an innovation, relatively rapid adoption by the remaining members and then a period in which the holdouts finally adopt.

The innovation decision is made through a cost-benefit analysis where the major obstacle is uncertainty. People will adopt an innovation if they believe that it will, all things being equal, enhance their utility. They must believe that the innovation may yield some relative advantage to the idea it supersedes. Also, in consideration of costs, people determine the extent to which the innovation would disrupt other functioning facets of their daily lives.

Since people are on average risk-averse, the uncertainty will often result in a postponement of the decision until further evidence can be gathered. But the key is that this is not the case for everyone. Each individual's innovation-decision is largely framed by personal characteristics, and this diversity is what makes diffusion possible. For a successful innovation, the adopter distributions follow a bell-shaped curve, the derivative of the S-shaped diffusion curve, and approach normality over time. Diffusion scholars (Rogers, 1962, & Ryan and Gross, 1943) divided this bell-shaped curve to characterize five categories of system member innovativeness, where innovativeness is defined as the degree to which an individual is relatively earlier in adopting new ideas than other members of a system. These groups are: 1) innovators, 2) early adopters, 3) early majority, 4) late majority, and 5) laggards. The personal characteristics and interaction of these groups illuminate the aforementioned domino effect.

Innovators are venturesome types that enjoy being on the cutting edge. The innovation's possible benefits make it exciting; the innovators imagine the possibilities and are eager to give it a try. The implementation and confirmation stages of the innovators' innovation decisions are of particular value to the subsequent decisions of potential adopters.

Early adopters use the data provided by the innovators' implementation and confirmation of the innovation to make their own adoption decisions. If the opinion leaders observe that the innovation has been effective for the innovators, then they will be encouraged to adopt it. This group earns respect for its judicious, well-informed decision-making, and hence this group is where most opinion leaders in a social system reside. Much of the social system does not have the inclination or capability to remain abreast of the most recent information about innovations, so they instead trust the decisions made by opinion leaders. Additionally, much of the social system merely wants to stay in step with the rest. Since opinion leader adoption is a good

indicator that innovation is going to be adopted by many others, these conformity-loving members are encouraged to adopt.

So, a large subsection of the social system follows suit with the trusted opinion leaders. This is the fabled tipping point, where the rate of adoption rapidly increases. The domino effect continues, even for those who are cautious or have particular qualms with the innovation, adoption becomes a necessity as the implementation of the innovation decisions of earlier adopters results in social and/or economic benefits. Those who have not adopted lose status or economic viability, and this contextual pressure motivates adoption.

The last adopters, laggards, can either be very traditional or be isolates in their social system. If they are traditional, they are suspicious of innovations and often interact with others who also have traditional values. If they are isolates, their lack of social interaction decreases their awareness of an innovation's demonstrated benefits. It takes much longer than average for laggards to adopt innovations.

The Diffusion of Innovations framework can be incorporated into this study by applying its principles to the adoption of educational technology in Vocational Training Centres. Principles include: identify the innovation, understand the adopter categories, analyse the innovation-decision process, consider the role of communication, social influence and perceived relative advantage. By incorporating the Diffusion of Innovations framework, the current study can better understand the complex factors influencing the adoption of educational technology and develop effective strategies to promote its diffusion in vocational training centres.

2.6.4 SAMR+C Model

The SAMR+C model expands upon the SAMR model by incorporating the concept of "C" for connection (Pfaffe, 2017). It emphasizes the importance of leveraging technology to foster collaboration, communication, and creativity in addition to the levels of substitution, augmentation, modification, and redefinition. This framework encourages educators to consider how technology can enable meaningful collaboration, effective communication, and innovative creative expression among graduates. The SAMR+C model can be incorporated into this study by applying its principles to the development and implementation of educational technology in

vocational training centres which includes leverage technology for collaboration, foster effective communication, promote creativity, integrate same levels and emphasise connection. By incorporating the SAMR+C model, the current study can ensure that educational technology is leveraged to promote meaningful collaboration, effective communication, and innovative creative expression among graduates in vocational training centres.

2.6.5 SAMR model

The substitution, augmentation, modification, and redefinition (Pfaffe, 2017) model encourages educators to reflect on their teaching practices and strengthen their pedagogy concerning enriching education with technology (Portnoy, 2018). Educators play a central role in the pedagogical planning process, including making decisions about integrating educational technology into their classrooms (Hilton, 2016; Hutchison & Woodward, 2018). The SAMR model is one educational technology integration rubric they can utilize as follows:

1. Enhancement
    a. Substitution: Technology acts as a direct tool substitute with no functional change.
    b. Augmentation: Technology acts as a direct tool substitute for functional improvement.
2. Transformation
    a. Modification: Technology allows for significant task redesign.
    b. Redefinition: Technology allows for the creation of new tasks, previously inconceivable.

This study focused on the four core aspects of the SAMR model, given that the purpose was to gain consensus on the essential components of the SAMR model related to pedagogy and learning in the twenty-first century.

These frameworks provide structured approaches to guide the adoption of educational technology, ensuring that technology integration is purposeful, pedagogically sound, and aligned with learning objectives. Educators can select and adapt these frameworks based on their specific needs and contexts. The SAMR model can be incorporated into the current study by applying its

principles to the development and implementation of educational technology in vocational training centres. Principles include reflecting on teaching practices, integrating technology, enhancing education and aligning with learning. By incorporating the SAMR model, the current study can ensure that educational technology is integrated in a way that enhances pedagogy, supports learning objectives, and promotes effective teaching practices in Vocational Training Centres.

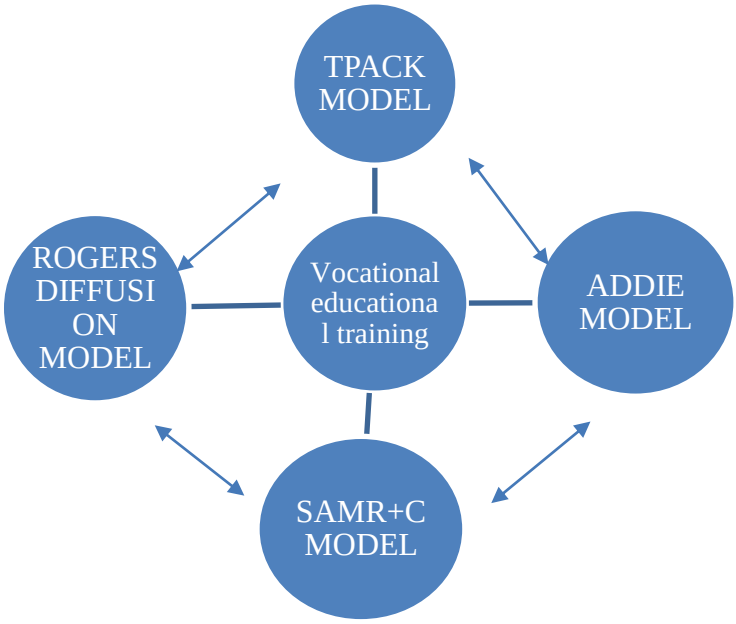


Figure 0.4: Integrated model (Researcher, 2024)

By combining the strengths of each framework, the study can develop a comprehensive approach to educational technology integration that addresses multiple aspects of teaching and learning.

Pedagogically sound: The integration of TPACK and SAMR ensures that educational technology integration is pedagogically sound and aligned with learning objectives.

Effective implementation: The ADDIE model provides a structured approach to implementation, while the Diffusion of Innovations framework informs strategies for promoting adoption and diffusion.

Enhanced learning experiences: The SAMR model encourages the transformation of learning experiences through technology, leading to more engaging and effective learning.

The SAMR+C model emphasizes the importance of connection and creativity, thereby promoting meaningful learning experiences and skills development.

Evaluation and improvement: The ADDIE model's evaluation phase and the Diffusion of Innovations framework's focus on feedback and revision facilitate continuous improvement and refinement of educational technology integration.

By integrating these frameworks, this study can develop a robust and effective approach to educational technology integration in VTCs, ultimately enhancing teaching and learning.

Contextualized: The integration of frameworks is contextualized to the specific needs and goals of vocational training centres, ensuring relevance and applicability.

2.7 Empirical Review

This review provides highlights on previous studies on the impact of the adoption of educational technology in VTCs. The literature assists in creating a profound understanding of the nexus between the adoption of education technology and vocational training centres. The studies are grouped into global, regional and local perspectives.

2.7.1 The types of educational technology being used in Vocational Training programmes.

Guner and Actarturk (2020) highlighted that to become an information society, it is required that the citizens have access to information and communication technologies (ICT) in appropriate ways. ICT plays a major role to improve inclusion of various parts of the society (such as children, disabled citizens, and elderly) into daily life. According to reports of WHO, the world population is getting older. This urges the need for a systematic investigation of ICT needs of elderly citizens and potential problems being faced during the course of interaction with ICT interfaces. The present study focuses on the use and acceptance of ICT by elderly citizens in comparison to younger adults by providing data from citizens living in Turkey. It reports data collected from 232 elderly participants (60-96 years old) and 235 younger adults (19-40 years old). The findings of the study show that, both elderly and younger adults confirm the technology acceptance model (TAM) in a similar way. This was accompanied by elderly citizens' need for assistance, encouragement

and friendlier interface designs. This study aims to contribute towards increasing awareness on the needs and expectations of elderly citizens and inspire further research on ICT use of the elderly population. The study's results indicate that both elderly and younger adults validate the Technology Acceptance Model (TAM) similarly, but with some age-specific nuances. While younger adults readily embrace educational technology, elderly adults require additional support, encouragement, and more user-friendly interface designs to facilitate adoption. The current study suggests that educational technology adoption in vocational training centres is not uniform across all age groups, highlighting the need for tailored approaches to accommodate the diverse needs of learners across various age ranges. By recognizing these differences, educators and administrators can develop more effective strategies to promote educational technology adoption and ensure that all learners, regardless of age, can benefit from its potential. The type of technology used can significantly impact educational technology adoption rates among different age groups. For instance, older adults may prefer simpler technologies like tablets or e-readers, while younger adults may be more comfortable with complex technologies like virtual reality or artificial intelligence. Additionally, technologies with user-friendly interfaces, such as large buttons and clear displays, may be more appealing to older adults, whereas younger adults may prefer technologies with advanced features and customization options. Furthermore, technologies that cater to specific learning styles, like visual or auditory learning, may be more effective for certain age groups. By considering the type of technology and its design, educators and administrators can create an inclusive and effective learning environment that caters to diverse age groups and learning preferences, ultimately promoting successful educational technology adoption.

Games have been used as a learning tool for centuries. Gamification and game-based learning are becoming more prominent in educational settings for several reasons. When it comes to learning, being focused and immersed can massively improve a student’s experience. The purpose of this study is to map the emerging trends of gamification and game-based learning (GBL) in the Vocational and Education Training (VET) sector. For this purpose, a Systematic Literature Review was conducted through the three most relevant scientific databases – Web of Science, Scopus, ScienceDirect, and PubMed with Google Scholar as a supporting database. The obtained sample was further selected following the PRISMA guidelines with screening and

eligibility processes conducted based on inclusion criteria that were defined with consideration to the research's aim. This review comprised seventeen studies. The findings revealed a growing interest in the Asian continents in research from 2020 onwards (Dahalan, et, al., 2024) . Furthermore, most of the study is centred on vocational schools and colleges in the engineering and healthcare fields. According to the overview, the digital learning platform and simulation technology are the most promising tools used in the research. The findings support the conclusion that gamification and game-based learning can improve academic performance, engagement, and motivation in vocational education learners. As a result, this study suggests that more research is needed to determine the gamification strategies that are most suited for vocational education and learning.

This study aims to develop a framework to enhance educational technology adoption in Zimbabwean vocational training centres. To achieve this, the study suggests that a mixed research method approach be used, combining both qualitative and quantitative methods. This will enable researchers to triangulate data, gain a comprehensive understanding of complex research questions, and quantify and qualify findings.

Useche et al., (2022) in their study makes a critical review of educational and operational issues related to digital transformation, it then describes the strategies to overcome such issues: (a) having a shared vision and technology integration plan, (b) overcoming the scarcity of resources, (c) changing attitudes and beliefs, (d) conducting professional development, and (e) reconsidering assessments (Mhlanga, Denhere & Moloi, 2022; Cichosz, Wallenburg & Knemeyer, 2021). Finally, it identifies several current knowledge gaps pertaining the barriers and strategies of technology integration and postpandemic lessons in Latin American higher education institutions (Latam Hei), as background for uncovering key elements to innovate educational practices in technology-mediated higher education. The authors adopted the reflexive pedagogy framework to conduct in depth analysis of innovation experiences mediated by educational technologies and drew conclusions for curricular and digital transformation of Latam Hei. Ethe-Latam issue showed educational technologies that emerged since the introduction of computer-mediated and online learning. Nevertheless, these technologies cannot be considered as new. The current study developed a framework to enhance educational

technology adoption as strategies of technology integration in Zimbabwean vocational training centres.

Kundu and Bej (2021) critically analyse the provisions for ET adoption in Indian National Education Policy (NEP) 2020 to add to its sharpness to give vision to Indian education for the next few decades. In this rational content analysis three basic aspects of NEP (2020) - pedagogical, institutional and the human factor - have been decoded, the significance of these factors has been established in existing literature, and their alignment in the Policy has been evaluated. The analysis finds this document as successful in capturing a comprehensive ethos of technology adoption with few limitations. All three factors have been attended. The advanced mind-set that the policy exhibits emphasises n the dematerialization and digitalization of content are hitherto a remarkable feat in the conservative Indian educational system. Few concerns have been raised relating to the implementation of this policy, especially relating to autonomy and self-reliance at the institutional level. Besides concerns regarding issues of human factors like developing skills among teachers, collaboration, developing group mind-set and efficacy have also been evolved. This analysis is well-intentioned from the point of view of policy review, restructure and renovation of any country especially the developing ones. The recommendations authors bring for institutional strengthening in a time-bound manner by forming the Working School Governing Bodies (WSGBs) and practicing the 3-E Model that may open up a new vista of ET integration at the school level.

This study aimed to develop a framework to enhance educational technology in Zimbabwean VTCs by addressing the existing gaps. The researchers suggest that besides developing skills among teachers, collaboration, developing group mind-set and efficacy are also crucial factors to consider. They propose the formation of Working School Governing Bodies (WSGBs) and the practice of the 3-E Model to strengthen institutions and promote ET integration. By addressing these gaps and implementing these strategies, the study hopes to close the gap and promote equal access to education for all. The researchers also emphasize the importance of understanding the plight of learners with special educational needs (SEN) and the support strategies in place to help them navigate technical and vocational education and training (TVET). They suggest that a social model of disability is adopted, which recognizes disability as stemming from physical, organisational, and attitudinal barriers in society. The study also highlights the importance of

creating an inclusive and supportive institutional community that can identify and minimize barriers to learning and participation for SEN learners. By addressing these gaps and implementing these strategies, the study hopes to close the gap and promote equal access to education for all, especially in developing countries like Zimbabwe.

Dzinoreva et al. (2023) address the challenges of underdevelopment bedeviling the African continent in general and Zimbabwe in particular on the integration of Artificial Intelligence (AI) in higher education. Universities in Africa have over the years produced many graduates in Science, Technology, Engineering, and Mathematics (STEM) related learning areas but continue to grapple with underdevelopment both economically and intellectually. Part of the problem has been identified as a lack of quality in the education system that is not able to produce graduates with adequate 21st-century skills for the achievement of the Sustainable Development Goals (SDGs) to fulfil the Global Agenda 2030. (Ohei, 2019) Achieving this is possible if Africa moves a step forward and embraces modern technologies like the integration of AI in her education system. A technologically astute graduate would be able to apply their knowledge in achieving the much needed sustainable economic development.

Dzinoreva et al. (2023) also highlights how the implementation of AI in higher education can foster a turnaround in Africa's education systems and lead to industrialisation and innovation. Pivotal aspects of AI such as the Turing machine test, cloud computing, big data, and machine learning are explored in an attempt to add value to the current education discourse. This study is situated in the interpretive paradigm, the qualitative approach was employed to gather data using several methods like equestionnaires (open-ended), document analysis, and review of journals and other academic publications. Purposive sampling of STEM educators from a renowned university in Zimbabwe was undertaken to gather information on the ground and the data was thematically analysed. The article argues that Africa has the potential to be a leader in Industrialization and commerce should the continent fully embrace AI in higher education. By developing a framework that promotes educational technology adoption, the study aims to enhance the quality of education and training in vocational training centres, ultimately driving economic growth and development in Zimbabwe. The framework will provide a roadmap for policymakers, educators, and administrators to harness the potential of AI and educational technology to transform the vocational education sector.

Hlongwane et al., (2024) investigated the success and challenges of Information Communication Technology (ICT) in Zimbabwean Polytechnics. The study was guided by the objectives that included assessing the success in common computing skills levels among the staff and students, investigating levels of usage of ICT skills, and the challenges in ICT skills adoption and integration between staff and students. The literature was presented by referring to different researchers that wrote on challenges of ICT adoption and integration in the form of constructive argument by the aid of authors in support and those against. The research adopted the interprevist research philosophy and the target population of the study constituted 220 employees of the polytechnics and was reduced to 140, making use of sample size determination model as suggested by Krejice & Morgan, 1970. Operating systems, word processing, spreadsheets, presentation software, and use of the internet were the common computing skills level among the staff and students. Frequency of use of ICT tools in teaching and learning, frequency of use of computers and the Internet for teaching and learning purposes, mandatory use of computers for teaching and learning, students being conversant with the use of ICT tools, and having a college budget to support ICT skills development determined the levels of usage of ICT skills adoption and integration between students and staff. The challenges in ICT skills adoption and integration between staff and students were lack of funding from the government and stakeholders, improper ICT infrastructure, expensive hardware and software costs and lack of skills and expert knowledge. The recommendations of the study were that the institutions should upgrade their ICT infrastructure and resources in order to maintain the success in computing skills level of staff and students, come up with short computer courses with diverse computer packages to enhance the level of ICT skills usage of staff and students and identify critical needs in the community and come up with potential projects to sustain themselves and build a reliable ICT infrastructure. This study sought to address the issue of developing a framework for enhancing educational technology in Zimbabwean vocational training centres rather than polytechnics.

Phuthi and Mazarire (2022) cited the benefits of equal opportunity and inclusivity to access education of choice as crucial to people in situations of deep scarcity and need. This study sought to analyse and evaluate how the universal policy of inclusive education was applied in technical and vocational education and training to enable learners with special educational needs to navigate their skills-based learning experiences. The study, using an inclusive education outcome framework, further interrogated the institutional support strategies put in place to normalise and

ameliorate the plight of affected learners. A qualitative research approach in the interpretivism paradigm was used to capture the perceptions of the affected learners and their immediate associates in two colleges of technical and vocational education in Zimbabwe. The participants generally applauded the national stance to adopt inclusive vocational and technical education, but contended that the application of the policy at institutional level lacked seriousness and needed due improvement. Institutional support was linked to, and dependent on, home, community and national support. The study concludes that the inadequate institutional support for SEN learners requires more inter-personal approaches towards sustainable improvement. The current study employed a mixed research methods approach, capitalizing on the strengths of both qualitative and quantitative methods. This design enables researchers to triangulate data, gain a comprehensive understanding of complex research questions, and quantify and qualify findings. Mixed methods research is particularly suitable for exploring complex research questions, examining subjective experiences, and working with small sample sizes. However, the researcher opted not to use a purely qualitative design, as the topic is not entirely new and does not require in-depth insights or methodological expertise (Creswell & Plano Clark). Instead, the mixed methods approach provides a robust and comprehensive understanding of the research question.

2.7.2 Factors influencing the adoption of educational technology adoption in Zimbabwean vocational training centres

Jian-Hong Ye et, al.., (2023) observe that, in an attempt to prevent and control the outbreak of COVID-19, education systems worldwide comprehensively implemented online courses to fulfil the educational goal at a time when physical lessons were suspended. Numerous online courses were developed under these circumstances. From the perspective of sustainable development goals, these online courses should be continued. However, as the epidemic gradually eases, it is questionable whether or not graduates will still willingly participate in these courses. The method of teaching is a critical issue for schools to decide. Compared with other related educational research, research on the vocational education system is still limited. To expand understanding on this topic, this study adopted snowball sampling and invited graduates from Chinese vocational colleges to fill in a questionnaire to help understand the perceptions that affect graduates' expectations, attitudes, perceived effects, satisfaction, and persistence of online learning. Compared with other related educational research, the research on the vocational

education system is still limited. To expand the understanding of this topic, this study adopted snowball sampling and invited graduates from Chinese vocational colleges to fill in a questionnaire to help understand the perceptions that affect graduates' expectations, attitudes, perceived effects, satisfaction and the persistence of online learning.

A total of 819 valid questionnaires were retrieved, with an effective questionnaire response rate of 81.9%. Meanwhile, under the framework of Expectation Confirmation Theory (ECT) and the Technology Acceptance Model (TAM), this study extended the theoretical model and proposed a sustainable model. The results of this study showed the following: 1). Expectancy belief and online learning attitudes had a positive impact on perceived ease of use and usefulness; 2). Perceived ease of use hurt practical class satisfaction but a positive impact on theoretical class satisfaction and perceived usefulness and 3). Perceived usefulness harmed practical course satisfaction but had a positive impact on theoretical course satisfaction. The current study sought to close the gap between limited vocational training studies and research methods by adopting a mixed research methods approach, capitalizing on the strengths of both qualitative and quantitative methods. This design enables researchers to triangulate data, gain a comprehensive understanding of complex research questions, and quantify and qualify findings. The mixed-methods research is particularly suitable for exploring complex research questions, examining subjective experiences, and working with small sample sizes. However, the researcher opted not to use a purely qualitative design, as the topic is not entirely new and doesn't require in-depth insights or methodological expertise. Instead, the mixed methods approach provides a robust and comprehensive understanding of the research question.

In Western Kenya, Musonye et al. (2021) in their research, there has been a growing focus on the various learning methods that TVET institutions' management needed to adopt in the time of COVID-19 pandemic. Therefore, this research aimed to establish the factors influencing the learning programmes in TVET institutions. On the other hand, the research utilized the COVID-19 pandemic as a dependent variable. The research followed a descriptive research design. This study's target population comprised all the 55 TVET institutions in Kenya's western region from which a sample size of 37 was drawn. Primary data was collected through the use of a questionnaire. Data analysis employed the use of descriptive and inferential statistics. The findings of this study indicated that learning resource strategy and relevance of learning

resources are the factors that affect the delivery of learning programmes most in TVET institutions. This study determined that factors that influence learning programmes are learning resource strategy, adequacy of learning resources, appropriate training workshop, industry support on learning resources, high quality of learning resources, and resources to provide psychosocial support. Institutions should allocate enough resources to ensure sustainability in achieving goals and objectives. To close the gap in the Zimbabwean context, TVET institutions can adopt strategies from the Kenyan study, tailoring them to local needs and resources. This includes developing a comprehensive learning resource strategy, ensuring adequacy and high quality of learning resources, and providing appropriate training workshops for educators. Additionally, fostering industry partnerships and providing psychosocial support for learners can enhance learning programmes. Institutions should allocate sufficient resources to support sustainability and achievement of goals. By contextualizing and collaborating with industry partners and government, TVET institutions in Zimbabwe can adapt these strategies to bridge the gap and improve learning outcomes. Therefore, this study seeks to develop a framework to enhance educational technology adoption in Zimbabwean Vocational Training Centres.

Research by Faustmann et al., (2019) in their study conducted in Denmark and German, observe that digital learning platforms connect the real with the digital place for learning and teaching. They allow for an innovative combination of different learning concepts and learning structures through the consistent use of the possibilities of digitalization. Furthermore, digital learning platforms democratize education because they ensure equal access by heterogeneous user groups through interaction, communication, and knowledge sharing.

The paper investigated the factors that affected the successful use of platforms for both knowledge consumers and knowledge providers. For this purpose, we considered the complete life cycle of the learning process which consists of course preparation, learning action, and feedback. If all participants were taken into consideration, there were various supporting factors and also obstacles to the successful implementation of knowledge transfer. The methodological approach used Self-Determination Theory in order to examine the motivations of learners and teachers based on survey data and a literature review (Alvarez et al., 2019; Menken & Toepoel, 2023). The main goal behind the approach was to understand and describe what contributed to a successful participation in such platforms. Subsequently, these success factors could be

translated into concrete requirements for a digital learning platform. This provided a basis for a discussion that could be applied to different forms of teaching and learning platforms such as learning management systems and Massive Open Online Courses (MOOCs).

This study adopted the Technology Acceptance Model (TAM) and Rogers' Diffusion of Innovation (DOI) theory. TAM focuses on technology acceptance and adoption, exploring factors like perceived usefulness and ease of use, while DOI investigates the adoption of innovations, considering factors such as relative advantage and compatibility. In contrast, SDT delves into the motivations and well-being of individuals, aiming to understand what drives successful participation in digital learning platforms. By considering both individual acceptance (TAM) and broader adoption patterns (DOI), a framework can provide a comprehensive understanding of how to successfully develop and implement educational technology.

Antonio et al, (2021) in their study, on the use of digital technology by senior citizens had improved in recent years in response to the need for their functional adaptation to an increasingly technological social context. Understanding this type of technological adaptation had recently become an important field of inquiry in both social and erotological studies. Working within this framework, the aim of this study was to identify the main determinants that influenced the intention of older people to use digital technology in their daily lives, using the Technological Acceptance Model. A study was carried out with the participation of 1155 people over 65 years of age in Spain. Confirmatory Factor Analysis and Structural Equation Models (SEM) were performed. The results show that the TAM is a useful model to explain the intention of older adults to use Digital Technology, showing a high predictive power, highlighting Perceived Usefulness and Perceived Ease of Use as the main predictor variables. The current study batresses the use of Technology Acceptance Model in order to enhance educational technology adoption by adult learners in Zimbabwe vocational training centres.

Michael et al., 2020 interviewed teachers who understood the necessity of multidisciplinary digital competence development, in Europe (Berger et al., 2018; Tisch & Metternich, 2017). For a minority, the focus of digitization of schools was still on providing fundamental responsive digital infrastructure. At first glance, this seemed a bit unexpected, considering that the interviewees worked at schools equipped with the latest smart factory equipment. At

second glance, it became clear that in addition to the Learning Factories (LF) 4.0 challenges such as the implementation of digital class books, fast and reliable Wi-Fi, which was also available in the entire school, not just in the room with the LF 4.0, or the procurement of digital devices still, had to be mastered, although German vocational schools were usually equipped technically and digitally above average (Krützer & Probst, 2006).Schools were also focusing on how to integrate digitization into their teaching. Most technical vocational schools did not have similar facilities and adequate human resources (Sommer, 2015). This could make it difficult to get help to further develop pedagogical concepts.

This study is limited by the fact that the statements were subjective personal opinions of the teachers. The sample's validity is also limited. However, given the fact that there were very few technical vocational schools with LFs 4.0, the sample could be called as a broad coverage. This was relevant to the current study as it assisted the researcher to compare notes using a different methodology during adoption of educational technology through adult learning in vocational training centres, a case of Zimbabwe vocational training centres.

Betlej et al., (2023) in their study investigated blind adults' experiences of adapting to digital technologies.The study focused on how they had been experiencing changes triggered by digital transformation. This provided the starting point for assessing the prospects and/or limitations for self-development through new technologies. The second point concerned designing technologies for blind adults by adding questions about their specific needs and expectations for digital device designers. To develop these main issues, they planned a qualitative grounded theory study in which 16 blind adults were individually interviewed. The study aimed to provide rich descriptions of a selected phenomenon. The research analysis was conducted by using the sociological and philosophical methods, which provided insights into the social assessment of digital development for ageing by blind adults.

The data analysis revealed five distinct categories that captured these experiences and expectations: (1) wishing to learn – "Digital technology gives privacy and independence"; (2) having to learn—"If you do not have new digital devices or do not know how to use them, you end up on the margins of society"; (3) being socially excluded"Designers of new technologies do not think about blind adults"; (4) fearing to stop understanding"Technological development is

too rapid, it is difficult to be on time while ageing"; and (5) waiting for the changes"Hope situation will change in the future". Together, these five categories formed the basis of the core category ageing and keeping pace with technology, which encapsulates the initial adaptation experiences of the interviewees to technological development. The findings indicated that blind adults experienced digital devices as tools for improving their well-being, but they also saw them as posing the threat of being socially excluded because of new technology designs and accessibility barriers. The current study is going to close gap of easy generalisation since it caters for everyone despite their age or status through developing of a framework to enhance educational technology adoption by adult learners in Zimbabwean vocational training centres.

Amirul et al., (2019) sought to explore vocational technical high school (VTHS) teachers' beliefs on ICT and its integration in education and the varied views of the teachers according to demographic dispersion. Quantitatively, a survey was done with 765 respondents; the analysis was descriptive using mean percentage, and standard deviation, as well as t-test and analysis of variance (ANOVA) for a difference between the demographic information namely genders, ages, and teaching experiences. Following the quantitative phase, interviews were conducted with 10 teachers to get in-depth information through a thematic process. Findings suggest that the VTHS teacher's beliefs on ICT and its integration in education mainly focused on 1) student engagement and effective learning,varied use of ICT regarding grades and content (behaivoural beliefs) and 2) needs of digital-age graduates and expectations of authorities, administrators, and colleagues (normative beliefs). This was relevant to the current study as it assisted the researcher to compare notes using a different methodology (quantitative) towards a framework of adoption of educational technology through adult learning in VTCs, a case of Zimbabwe Vocational Training Centres. Despite the interest, little was known about the adoption of educational technology through adult learning in vocational training centres. Current studies into adoption of educational technology were mainly small-scale trials and pilots with most focusing on student adoption at tertiary institutions. Adoption of educational technology through adult learning in vocational training centres was ignored.

Ashwin, (2018) investigated the influence of values, culture and context on technology adoption behaviour. This thesis aimed to theoretically develop and validate the Values-Enhanced Technology Adoption (VETA) model, integrating Schwartz's Theory of Human Values with the Unified Theory of the Acceptance and Use of Technology (UTAUT2). The VETA model was validated through survey data in four research organisations based in East Africa (Kenya and Uganda), The Gambia and the United Kingdom. Contextual differences in adoption factors were explored through interviews with e-learners. Workers were surveyed during their participation in a professional e-learning course and interviewed six weeks after their e-learning experience. Survey analysis was completed using Partial-Least-Squares Structural-Equation-Modelling (PLS-SEM); interview data was analysed through computer aided thematic analysis.

The VETA model was partially confirmed in the context with performance expectancy, price value, and habit predicting learner intention to use e-learning. Values interacted with the VETA model as predictors of adoption factors. The value of achievement was most important in predicting intention to use e-learning. Learner's prioritizing achievement as an important aspect of their worldview perceived e-learning to be important in their social context and worthwhile in terms of cost and benefit. The type and source of social influence differed in the African contexts from the UK: peer, champion, and manager influence were informational for African learners. The lack of facilitating conditions in the African environment was a perceived barrier to e-learning use by African learners that could be overcome with special endeavours which were not needed in the UK environment.

This thesis demonstrated the integration of values and technology adoption literature in the development and validation of the VETA model, and expanded the constructs of social influence, price value, performance expectancy and facilitating conditions in sub-Saharan Africa and the UK. Despite contextual differences, the VETA model applied consistently across the East African, West African and UK contexts. This is very important to the current study as it assists the researcher to compare theories used in adoption of educational technology through adult learning in Vocational training centres in Zimbabwe contrary to the three contexts of this study.

Rachel (2021) identified the efficiency of educational institutions as critical in the justification of resource allocation and use in Kenya. However, some developing countries like Kenya face efficiency challenges regarding resource utilization and the flow of graduates through the school system at various levels of education and programmes. Past research in Kenya focused more on resource utilisation in public schools. Very few studies have looked at the internal efficiency of public VTCs. This paper assesses the level of internal efficiency in Kenya's public vocational training institutions through a mixed research design. The findings reveal low levels of internal efficiency as indicated by low enrolment, high dropout and low completion rates in the VTC institutions. The result also shows a low level of tutor utilisation. These results provided vital insights into improving the internal efficiency of public vocational training institutions in developing countries. The study recommends, among other things, subsidisation of examination fees to enhance graduates' completion rates.

This is pertinent to this study as it highlights low levels of internal efficiency as indicated by low enrolment, high dropout and low completion rates in the vocational training centres (VTCs). The result also shows a low level of tutor utilisation. These results provide vital insights into improving the internal efficiency of public vocational training institutions in developing countries. This study looked at the adoption of educational technology in Vocational Training Centres in Zimbabwe.

Muwaniki et al. (2022) highlighted that there is a need for the agricultural technical vocational education and training curriculum in Zimbabwe to be reformed so that it responds to changes in farmer demographics, expanding roles of Agricultural Extension Officers (AEOs), and instituting changes in technology and climate change approaches. The current agriculture curriculum was developed for a different context altogether; therefore, it now lacks relevance to the prevailing socio-economic, political and environmental changes. There is a need for the curriculum to respond to the evolving needs of farmers, AEOs and institutions providing agricultural extension, and to match the changes in AEOs' occupation role profiles. This article draws on curricular documents from five institutions involved in the agricultural extension curriculum and policy, together with 22 respondents, to expose gaps in the agricultural extension curriculum. In addition, the article explores how the curriculum can be re-imagined to meet the needs of small-scale farmers, AEOs and emerging agricultural developments and digital technologies. The

authors advance what might be the processes of change in the curriculum, highlighting the weaknesses of the current curriculum as well as what a more responsive curriculum for Zimbabwe should look like in the light of both local and international expectations. In so doing, it contributes to a wider international debate about agricultural education reform. The current study adds value by developing a framework to enhance educational technology adoption in vocational training centres.

Marti (2019) provides information about the South African Technical and Vocational Education and Training (TVET) system from a German perspective. Due to a shift in South Africa's economy towards the service sector, the existing skills composition did not fit the needs anymore and could hinder further development. Foreign and local companies had a high demand for skilled workers. A short introduction to the TVET system is provided and challenges are pointed out. Furthermore, the role of the Skills Education Training Authorities in TVET is described. Finally, the current state of South African-German cooperation in the TVET sector including a selection of projects on different levels involving German and South African institutions is outlined.

Makochekanwa, Mahuyu and Pimbiriri (2021) investigated the perceptions of employers regarding technical and vocational training (TVET) system in Zimbabwe. A total of 57 employers of TVET graduates throughout the country were sampled and information and data were collected using a structured questionnaire. The study found that, overall; the employers had high positive perceptions about the quality of TVET training programmes in Zimbabwe. Major challenge to TVET training was that TVET institutions in Zimbabwe were equipped with obsolete and old equipment which was very much behind machines and equipment used in the industry. Furthermore, the study found that TVET training programmes emphasized theory more than hands-on practical skills. Going forward, employers suggested that to close the gap between equipment in stock and the technological frontier, TVET institutions and respective funders should raise money to buy new equipment and ensure continuous upgrading of such equipment.

This previous research, like the one carried out by Marthi (2021) in South African looked at Technical and Vocational Education and Training (TVET) system from a German and South

African perspective. The literature reviews were relevant to the current study as they helped to answer one of the objectives of graduates' attitude towards adoption of educational technology in vocational training centres in Zimbabwe. A study conducted by Makochekanwa, Mahuyu and Pimbiriri (2021) looked at employers' perceptions of Technical vocational Education and Training activities in Zimbabwe this gave a clue on how dependency is perceived on the adoption of technology. This study focused on employers' perceptions of Technical vocational Education and Training activities in Zimbabwe whilst the current study is towards a framework for educational technology adoption by adult learners in Zimbabwean vocational training centres.

2.7.3 The attitudes of adult learners towards modern educational technology

A study carried out Betlej, Gondek and Gonek (2023) examines from a constructivist perspective the extent to which factors considered as key predictors of acceptance and use of technology contribute to EFL teachers and students' attitudes towards the use of ICTs in the teaching and learning of EFL. Moreover, it explores their actual use and continued intention to use ICTs to develop the four language skills and their sub-skills within the blended learning modality in a tertiary context. The study adopts the Unified Theory of Acceptance and Use of Technology (UTAUT model) as a theoretical framework. However, it uses a version of the model adapted to the context of the investigation that included constructs such as performance expectancy, effort expectancy, social influence, ICT self-efficacy, and facilitating conditions as the independent variables, and attitudes, actual use, and continuance intention to use as the dependent variables. Research participants were 70 EFL teachers and 468 EFL students from the University of Pitic located in northern Mexico. The study adopts a mixed-methods approach and a concurrent triangulation strategy. The methods for data collection were surveys, focus group interviews, and classroom observations.

Multiple regression analysis revealed that all the predicting variables examined contributed positively to attitudes. However, performance expectancy followed by effort expectancy was the strongest in contributing to their attitudes towards the use and continuance intention to use ICTs. Besides, results showed that attitudes, actual use, and continuance intention to use are highly correlated. Although these results do not indicate causality, they suggest that teachers and students' attitudes may influence their actual usage and continuance intention to use ICTs.

Moreover, qualitative results helped better understand and extend the information obtained through quantitative methods.

In addition, the study found that most teachers and students show positive attitudes towards the use of ICTs, and they are willing to continue to use them in the teaching and learning of EFL. The way they use ICTs gave evidence that they are aware of their affordances and limitations, and capable enough to use them. They have developed learning autonomy, making their own decisions about which technologies to use and how to use them, and they look for support when using new or more complex ICTs. The study also discovered that the patterns of use, electronic devices, and online resources change in the face-to-face and online modes depending on the learning objectives and the type of activity. However, there is a need for implementing ongoing training programmes that help teachers teach in an integrated way since technology is mainly used to teach grammar and vocabulary, either in in-class activities as in out-of-class activities. Also, this study suggests eliminating the barriers identified that hinder teachers and students' use of ICTs, as well as removing those that specifically affect the area of language learning with technology. The current study employed a mixed research methods approach, capitalizing on the strengths of both qualitative and quantitative methods. This design enables researchers to triangulate data, gain a comprehensive understanding of complex research questions, and quantify and qualify findings. Mixed methods research is particularly suitable for exploring complex research questions, examining subjective experiences, and working with small sample sizes. However, the researcher opted not to use a purely qualitative design, as the topic is not entirely new and doesn't require in-depth insights or methodological expertise. Instead, the mixed methods approach provides a robust and comprehensive understanding of the research question. To address the need for implementing ongoing training programmes that help teachers teach in an integrated way the current study developed a framework to enhance educational technology adoption.

ii. The voices of pre-service teachers a study conducted by Reza (2022) at University of Tehran, Iran had been increasing interest in the implementation of digital game-based learning in language teaching contexts. This study used a mixed-methods design to unpack the attitudes of Iranian pre-service teachers of teaching English as a foreign language (TEFL) towards the

implementation of digital game-based learning. Pre-service teachers of TEFL participated in the survey (n=101) and interviews (n=32). The construct of the questionnaire was validated using factor analysis. The results indicated that the pre-service teachers had favourable perspectives on Digital Game 3-Based Learning (DGBL). The participants perceived that DGBL could enhance collaborative and interactive learning, develop graduates' problem solving skills, and create authentic language learning contexts. The perceived challenges of DGBL included teachers' lack of knowledge about DGBL, the lack of digital facilities in classes, and the lack of availability of suitable educational digital games. The participants believed that DGBL could be very effective for adolescents, effective for young learners, moderately effective for young adults, and slightly effective for adults. Regarding the language learning skills, it was perceived that the implementation of gamebased learning could be very effective for teaching vocabulary and pronunciation, and effective for teaching speaking, listening, and grammar; however, the participants believed that digital games could be slightly effective for teaching reading comprehension and writing. In the interviews, the pre-service teachers pointed out that they had limited/no use of digital games in their teaching. The pre-service teachers proposed some suggestions for facilitating the implementation of DGBL. The suggestions included training teachers about the principles of digital game-based learning, equipping classes with the digital facilities required for digital game-based learning, engaging English as a Lingua Franca (EFL) teachers in digital game development projects, and fostering teachers' digital literacy levels. Factors such as the age of the learners, levels of proficiency, and teachers' and graduates' attitudes towards DGBL were regarded as important in its implementation. The study offers several implications for renewing current EFL courses and TEFL teacher training/education programmes.

A study conducted by Staddorn (2020) at University of Sheffield, indicated that mature graduates are anecdotally thought to be more anxious about technology than younger graduates. This is a problem in today's higher education classrooms which often use a range of learning technologies, particularly as cohorts are becoming more and more likely to contain mature graduates. Previous work examining the attitudes of mature graduates to technology no longer reflects contemporary student age profiles or the current technological landscape. This study asked whether modern mature graduates in a UK university had more negative attitudes towards

technology than younger graduates, and whether their usage of technology was different. A new diagnostic instrument, the Technology Attitudes Questionnaire, was developed to determine how graduates use technology for course activities and personal use, and their attitudes towards technology in general. It was found that mature graduates used fewer technologies than younger graduates and used them less frequently, but used them for a longer period over their lives. No difference was found for attitudes towards technology between the mature and younger groups. This research contributes to the wider field of technology attitudes and use, particularly for the modern mature student cohort. The findings could be used to inform how educators design learning resources and use technology on their courses, working towards an age-inclusive programme.

This study through the use of mixed research can close the gap on attitudes towards technology between the mature and younger groups. Qualitative research methods are essential for gaining a comprehensive understanding of complex phenomena, as they provide rich, detailed insights into people's experiences, perspectives, and behaivours. By considering the context in which individuals live, work, and interact, qualitative research offers a nuanced understanding of the research topic, allowing for the exploration of new ideas, identification of patterns, and generation of hypotheses. Additionally, qualitative methods capture the subjective experiences and meanings that individuals assign to their experiences, examining processes and dynamics to reveal how and why things happen. With their flexible and adaptive nature, qualitative research designs can evolve in response to emerging findings, ensuring validity and reliability. By amplifying participant voices, qualitative research promotes empathy and understanding, providing detailed and contextualised data that can inform evidence-based practices and complement quantitative research. Ultimately, qualitative research methods offer a unique and valuable perspective, enriching our understanding of the world and facilitating informed decision-making.

Curran et al., (2019) argue that mandatory continuing professional education is accepted across many professions as a re-credentialing mechanism to maintain professional competency. Self-directed learning is a widely recognized type of learning to meet mandatory continuing professional education requirements. The nature and characteristics of self-directed learning have been transformed with the growth in digital and mobile technologies, however, there is minimal

understanding of the role of these technologies in the self-directed learning habits of adult learners. This study sought to explore the perspectives of adult learners on the effect of digital and mobile technologies on continuing professional education activities. Semi-structured interviews were conducted with 55 adult learners from four professional groups nine (physicians; 20 nurses; four pharmacists; 22 social workers). Key thematic categories included perceptions of self-directed learning, self-directed learning resources, key triggers, and barriers to undertaking self-directed learning. Digital and mobile technologies emerged as important resources supporting the self-directed learning of health and human services professionals. Increasing usage and dependency on these technologies have important implications for organisational and workplace policies that can support effective self-directed learning processes in a digital age. A conceptual model is introduced to characterize the key factors defining the self-directed learning patterns and practices of adult learners in a digital age. The current study seeks to address the issue of self-directed learning by adult learners through the developing of a framework to enhance educational technology adoption in Zimbabwean vocational centres thereby filling the geographical gap.

Elhajjar and Yacoub (2022) observe that new marketing strategies, new perspectives, and new trends have emerged significantly due to the COVID-19 pandemic. Many higher education institutions are challenged to adapt to these rapid changes as well as to choose the right marketing approaches. The purpose of their study was twofold: to explore the COVID-19 impact on marketing for Higher Education Institutions (HEI) in Lebanon and to discover the marketing practices applied by institutions amid the pandemic. Empirical data were gathered through 24 in-depth interviews. Findings revealed that Lebanese institutions were expected to make substantial changes to their marketing in a COVID-19 business environment; these included new post-pandemic plans for a return to normalcy and shifts in marketing strategies toward digital reinforcement. This paper would help build a more robust theoretical body of knowledge regarding Higher Education Marketing (HEM) in the context of developing countries.

Tosum and Mihci (2020) in their study, reflected results from preliminary work for designing a digital parenting educational programme for parents with preschool children in the Turkish

province of Edirne. Convenience sampling method was used and a group of 231 parents participated in the study.

Qualitative and quantitative methods were both used in this sequential mixed method research of descriptive nature. The Digital Parenting Attitude Scale was used for data collection purposes, alongside a questionnaire form developed by the authors. It was understood that; (a) the digital parenting attitude scores of participants were found to be relatively low, with an average score of 21.74; (b) half of the participants were not willing to participate in a digital parenting educational programme and that those unwilling to participate were also those who displayed poor digital parenting attitude; (c) not only gender and employment status, but also other variables such as awareness in concepts of digital footprints or cyber-bullying resulted in significant differences in terms of digital parenting attitudes; (d) descriptive accounts of Turkish parents showed that they were prone to conceptualizing digital parenting as screen time policies only; and (e) digital parenting educational programmes should focus not only on the digital but also on (conventional) parenting skills and the notion of sustainability.

Results emphasized the importance of increasing public awareness towards concepts related to digital parenting, as well as the economic exploitation of children in the cyber world and the establishment of a dialogue with the child on this critical matter. Further research in the subject, especially with (a) greater emphasis on sustainability, (b) greater contribution from male participants, and (c) on the subject of specific deterrents against participation in digital parenting education may be needed. The current study is not focusing on marketing strategies rather it is towards developing a framework to enhance educational technology adoption in Zimbabwean vocational centres thereby filling the geographical gap.

vi Supplement study carried out by Hove and Chinamasa (2023) in their paper was a follow up to South Africa mathematics teachers' request for teaching methods in which calculators were used. It explored teachers' teaching methods as a basis for deducing teaching methods which required the application of calculator for instruction. The pragmatist philosophy facilitated the application of a combination of qualitative and quantitative research methods to enhance validity. Data were gathered from a purposive sample of SHARP model EL-531 WH direct algebraic logic calculator manual analysis. This was the preferred calculator (rich source)

available in the schools. Further document analysis was focused on mathematics textbooks and mathematics teaching methods. A survey of a purposive sample size (n = 49) teachers' preferred mathematics teaching methods was carried out in the circuit (Robinson et al., 2020). Focus group discussions with mathematics teachers funneled to group perceptions. Direct quotations for qualitative data were used to present accurate reflection of opinions from individual participants' registers. The study found that, most teachers (84%) preferred lecture and demonstration as the method for bivariate data instruction using calculators. The rationale was that it was a skills development technique which reserved teachers' mathematics expert power. Unfortunately, some teachers were not experts in calculator applications. The project method was rated lowest because teachers had low knowledge of its use. This study's participants learned how to interpret calculator manuals. This was an important contribution of the study to teacher skills development. In addition, the study's formulation of project teaching method as one of the methods which could be used to teach bivariate data using calculators was its' main contribution to teachers of mathematics. The calculator is mainly used as a motivation tool for computation. The study recommended storytelling (Fuller-the human calculator of Virginia) is ideal, plan the project from a problem project perspective to involve learners in solving the problem and demonstrate the application of the calculator to check the manual computation.

The study's contributions and recommendations can inform the development of a framework for enhancing educational technology in vocational training centres in the following ways:

a. Teacher Skills Development: The study highlighted the importance of teacher skills development, particularly in using educational technology such as calculators. The framework could include training and support to enhance teachers' knowledge and expertise in utilizing educational technology effectively. This could involve workshops, professional development programmes, and resources that specifically address the use of technology in vocational training.

b. Incorporating Project-based Learning: The study identified project-based learning as a potentially effective method for teaching bivariate data using calculators. The framework should promote the integration of project-based learning approaches in vocational training centres. This involves designing projects that engage learners in solving real-world problems and integrating the use of calculators to enhance data analysis and interpretation skills.

c. Starting with storytelling: The study recommended starting the teaching process with storytelling, such as sharing the story of Fuller, the human calculator of Virginia. The framework can incorporate storytelling techniques as a strategy to engage learners and create context for the use of educational technology. Storytelling can help learners connect with the subject matter and understand its relevance to their vocational training.

d. Problem-based approach: The framework should emphasize a problem-based approach to project planning and implementation. By framing projects around specific problems or challenges relevant to the vocational training context, learners can actively engage in problem-solving and develop practical skills. This approach encourages learner autonomy and promotes the application of educational technology to solve real-world problems.

e. Demonstration and manual computation: The study recommended demonstrating the application of calculators to check manual computations. The framework should encourage teachers to provide demonstrations and practical examples to help learners understand how to use educational technology effectively. This can involve step-by-step guidance, hands-on activities, and opportunities for learners to practice their skills using calculators.

f. Technology as a motivation tool: The study identified the calculator as a motivation tool for computation. The framework should recognize the motivational aspects of educational technology and explore ways to leverage it in vocational training centres. This could involve incorporating gamification elements, interactive simulations, and other motivational strategies to enhance learner engagement and participation (McCallister, 2019; Dahalam, Alias & Shaharom, 2024).

g. Addressing knowledge gaps: The study highlighted that some teachers had low knowledge of project-based learning methods. The framework could address knowledge gaps by providing training and resources that specifically focus on project-based learning and the effective integration of educational technology in vocational training. This can empower teachers to confidently incorporate innovative teaching methods into their instruction.

By considering these contributions and recommendations, the framework for enhancing educational technology in vocational training centres can provide guidance and support for

teachers in utilizing educational technology effectively, promoting active and engaging learning experiences, and enhancing vocational training outcomes.

Muyambo-Goto et al. (2020) in their study highlighted that the 21st-century ushered in accelerated new technologies, new knowledge and new information and the fourth industrial revolution (4IR) – causing rapid changes in the way humans live and work. This has resulted in an outcry for educational reforms globally. Many frameworks and debates centred on rethinking and reshaping the curriculum including what knowledge, skills, values and attitudes should be taught to prepare learners to thrive in the 21st-century, have been developed. This study examined the graduates' conceptions of 21st-century education in four diverse schools in Zimbabwe. The study was framed by the powerful complexity theory. The study used a quantitative non-experimental correlation design to collect data from four secondary schools, three of which followed the ZIMSEC syllabus and the other, a private school that followed a Cambridge syllabus. The questionnaire was adapted from the Partnership for 21st century framework (P21) and (Ravitz, 2014) to fit the Zimbabwean context. A total of 236 graduates and 93 teachers took part. Exploratory and confirmatory factor analyses and ANOVA were used to analyse the data. The results showed that the graduates' conception of 21st-century skills was defined by three factors: the learning of self-management, learning skills and values and the learning process. Graduates most strongly endorsed self-management. It was envisaged that the proposed model of Zimbabwean graduates' conceptions of 21st-century skills would act as a baseline for theory, policymakers, head teachers, teachers and teacher education colleges to realign the current teaching to fit the 21st-century curricula.

This study utilized a mixed research methods approach, combining the strengths of both qualitative and quantitative methods to achieve a comprehensive understanding of the research question. This design allowed for data triangulation, providing a robust and detailed understanding of the complex research topic. While a purely qualitative design could have offered in-depth insights, the researcher chose a mixed methods approach as the topic is not entirely new and doesn't require specialized methodological expertise. Instead, the mixed methods design provided a comprehensive understanding of the research question, enabling the development of a framework to support the implementation of ongoing training programmes that enhance educational technology adoption and promote integrated teaching practices. This

framework addresses the need for effective teacher training, fostering the successful adoption of educational technology and ultimately improving teaching and learning outcomes.

Muzurura et al. (2021) observe that in today's technologically-driven educational landscape, mobile learning systems (MBL) have progressively risen to become critical tools for effective education delivery in many rural schools. As evident in most developing countries, the education sector in Zimbabwe plays a critical role in facilitating human capital development and economic growth and development. However, the country's rural secondary schools are still lagging behind urban secondary schools in embracing MBLs. The adoption of MBLs could represent a significant breakthrough not only in terms of reducing educational costs but also in providing effective and efficient learning and teaching processes.

The adoption and acceptance of MBLs are likely to transform rural secondary school graduates' lives by enabling them to access cheap education and also to meaningfully contribute to the eradication of poverty and hunger in their communities. The study employed structural equation modelling where data were collected with the aid of a structured questionnaire from 100 randomly selected respondents attending rural schools in Guruve and Chiota Rural Districts. The findings show that the likelihood of adopting or deferring the adoption of MBLs in rural secondary schools is influenced by factors such as perceived usefulness, compatibility, perceived ease of use, social influence, learner and teacher's autonomy, relative advantages and learner awareness. Policies that increase usage of mobile banking learning systems in rural secondary schools, especially the reduction in transaction cost, perceived risk, and complexity of user interfaces are recommended.

Based on the findings mentioned, the current study on enhancing educational technology in vocational training centres can be informed in the following ways:

a. Perceived usefulness: The study should assesses and emphasizes the perceived usefulness of educational technology in Vocational Training Centres. This involves examining how technology can enhance vocational training outcomes, improve skills acquisition, and provide access to relevant resources and learning materials. Highlighting the potential benefits of educational technology can positively influence its adoption.

b. Compatibility: The study should explore the compatibility of educational technology with the specific needs and requirements of Vocational Training Centres. This includes considering the alignment of technology with the vocational training curriculum, the availability of appropriate hardware and software, and the integration of technology into existing training practices. Assessing compatibility can guide the selection and implementation of suitable educational technology solutions.

c. Perceived ease of use: The study should investigate the perceived ease of use of educational technology in Vocational Training Centres. This involves assessing the user-friendliness of technology interfaces, the intuitiveness of navigation, and the simplicity of accessing and interacting with learning materials and tools. Identifying potential usability barriers and providing training and support can enhance adoption and usage.

d. Social influence: The study should consider the influence of social factors on the adoption of educational technology. This includes examining the role of trainers, peers, and industry professionals in shaping attitudes and perceptions towards technology integration in vocational training. Identifying influential stakeholders and implementing strategies to promote positive social influence can facilitate adoption.

e. Learner and teacher autonomy: The study should explore the impact of learner and teacher autonomy on the adoption of educational technology in Vocational Training Centres. This involves investigating how technology can empower learners and trainers to take ownership of their learning and teaching processes, personalize learning experiences, and foster independent skill development. Highlighting the advantages of autonomy and providing support for its implementation can encourage adoption.

f. Relative advantages: The study could asses and communicates the relative advantages of educational technology compared to traditional training methods in Vocational Training Centres. This includes considering the benefits of technology in terms of cost-effectiveness, scalability, accessibility to up-to-date industry information, and the potential for immersive and interactive learning experiences. Demonstrating the advantages can motivate stakeholders to embrace the integration of educational technology.

g. Learner awareness: The study should focus on raising awareness among learners, trainers, and vocational training centre administrators about the potential of educational technology in enhancing vocational training outcomes. Providing information, conducting training programmes, and showcasing successful case studies can improve awareness and promote the adoption of technology in vocational training centres.

h. Reduction in transaction cost: The study should recommend policies that address the financial barriers associated with adopting and maintaining educational technology in Vocational Training Centres. Strategies could include providing subsidies or grants for hardware and software acquisition, negotiating lower costs with technology vendors, or exploring open-source and low-cost alternatives.

i. Perceived risk and complexity of user interfaces: The study should suggest ways to mitigate perceived risks and simplify the user interfaces of educational technology in vocational training centres. This may involve addressing concerns related to data security and privacy, providing clear instructions and support for technology use, and designing intuitive interfaces that are accessible to users with varying technological backgrounds.

By considering these factors and recommendations, the current study could contribute to the development of a framework for enhancing educational technology integration in Vocational Training Centres. This framework can guide decision-making, policy development, and implementation strategies to effectively leverage technology for improved vocational training outcomes.

2.7.4 Competency of facilitators towards modern educational technology

Slimani and Aatta (2022 highlighted that scholars and researchers adhere to the prominent role information and communication technologies (ICT) play in education, particularly in language teaching. The International Society for Technology in Education (ISTE) has developed a set of standards that provide a framework for developing digital competencies among educators, students, administrators, coaches, and computer science teachers. In light of ISTE standards for educators, the present paper probes the roles teachers play with special reference to the designer and facilitator standards. The target population are EFL Moroccan high school teachers who

work in the private sector in the Directorate of Marrakesh, Morocco. Through a quantitative analysis, findings indicate that the teachers in question generally fulfil their roles as ICT designers and facilitators. They adopt technology as a buttressing tool to install a conducive environment for learning. Plainly enough, they use technology-enhanced activities that promote student-centred learning. To a lesser degree, they facilitate collaborative learning and encourage the students to act globally by getting them engaged with the real world through technology. Likewise, this study discloses the existence of a symmetrical relationship between the mastery of internet/computer skills and the use-effectiveness of ICT tools, such as the interactive board and the data shown. In this respect, this study accentuates how adequate training and professional development-bound upskilling can truly promote the target EFL teachers' digital competencies and help them live up to their roles as ICT designers and facilitators. The current study aimed to develop a framework to enhance educational technology adoption by adult learners in Zimbabwean vocational training centres, which can lead to improved access to quality education, increased efficiency, and enhanced engagement.teachers' digital competencies and help them live up to their roles as ICT designers and facilitators.

Thuwe and Kalman (2023) indicated that contemporary youth require novel talents and fluencies due to the profound changes that are taking place in society. From school education to professional development and lifelong learning, everyone needs to have twenty-first-century skills to cope with these changes and the new normal. Lifelong learning should be the guiding idea for the future revitalization of the teaching profession. The development of lifelong learning competencies will enable teachers to help their graduates become lifelong learners. Teacher education is undoubtedly the most important component for teachers who seek to gain lifelong learning competencies. The study of teacher education is essential for investigating the factors that affect lifelong learning competencies among teacher trainers. The main aim of this study was investigating whether perception of lifelong learning and learning strategies could explain teacher trainers' lifelong learning competencies, and to examine whether their professional and personal factors could influence this. For this study, a correlation research design was chosen. The research sample was made up of 232 teacher trainers from various education degree colleges in Myanmar using random sampling method. Multiple linear regression analysis was performed to formulate the regression models for lifelong learning competencies of teacher trainers, and

analysis of variance was also utilized to create a comparison between the outcome models. The results indicated that teaching experience, perception of lifelong learning, and learning strategies could be the best regression models for predicting lifelong learning competencies in teacher trainers. This research could also be useful for establishing practical policy to implement lifelong learning competencies within the formal and non-formal education sectors. The current study on a framework to enhance educational technology by adult learners in Zimbabwean vocational training centres indicated that teaching experience, perception of lifelong learning, and learning strategies could be the best regression model for predicting lifelong learning competencies in teacher trainers. This research could also be useful for its framework to enhance educational technology and decision.

IJahanban-Isfahlan et al., (2017) have indicated that technology has influenced virtually all spheres of our lives, and teaching English as a foreign language (EFL) is not an exception to this rule. Also, teachers' undeniable and decisive role in the integration of technology into teaching is not to be ignored. With this in mind, this study explored Iranian high school EFL teachers' attitudes toward, their perceived competency in, and their actual use of instructional technology in their classrooms. 120 randomly selected junior and senior high school Iranian EFL teachers filled out the survey of high school EFL teachers' attitudes toward computer technology. Over 600 junior and senior high school students filled out students' questionnaire surveying the use of educational technology by English teachers in classrooms. The results indicated that even though Iranian teachers have an overall positive attitude toward (computer) technology, they are not sufficiently competent to use it in their classes, and this lack of competence may be one of the main barriers to the full use of technology in their classes. The current study sought to address the challenge faced by teachers even with a positive attitude toward (computer) technology, they are not sufficiently competent to use it in their classes, and this lack of competence may be one of the main barriers to the optimum use of technology in their classes. The current study aims to develop a framework to enhance educational technology adoption by adult learners in Zimbabwean vocational training centres, which can lead to improved access to quality education, increased efficiency, and enhanced engagement. By integrating technology into their learning, adult learners can develop new skills, become more competitive in the job market, and build their confidence.

The framework can also help build the capacity of Vocational Training Centres to effectively integrate technology into their programmes, leading to scalability and wider impact. Ultimately, this study has the potential to empower adult learners to take control of their learning and development, leading to better outcomes for themselves and the broader society. By addressing the specific needs and challenges of adult learners in Zimbabwean VTCs, this study can make a meaningful contribution to the improvement of vocational education and training in the region.

Núñez-Canal et al. (2022) ndicated that the digital revolution has substantially impacted education. The evolution of the use of technologies in education has been gradual and different, mostly depending on the teaching professionals' predisposition and skills. With the advent of the COVID-19 pandemic, digital tools' impact has been exponential in all educational levels.

A study of the new educational hybrid model is offered. The role of the educator is critical in this new model, confirming the necessity to have technical resources and qualified educators to improve graduates' competence in order for them to work successfully in the digital economy. The study reflected on the evolution of Educators' Digital Competence (EDC) and its relationship with graduates' digital skills and impact on the learning process. An analysis of digital competence-learning in the context of the student-centred-learning approach was studied. A more holistic approach to EDC is suggested.

The European Framework for the Digital Competence of Educators (Dig Comp Edu), in 2017 identified 22 competences in six areas. This paper analysed 251 responses from a convenience sample of professors from Madrid's universities in business administration based on this validated instrument. The results show the relevance of educators' characteristics to the learning process concerning previous knowledge about technology, training received, and their attitude toward technology. From a theoretical point of view, these competencies were grouped into four competency areas, and their level of impact on student learning was determined. Digital competence evolved from being a mere tool to becoming an essential pedagogical element.

The current study aimed to develop a framework to enhance educational technology adoption by adult learners in Zimbabwean vocational training centres, which can lead to improved access to quality education, increased efficiency, and enhanced engagement. By integrating technology

into their learning, adult learners can develop new skills, become more competitive in the job market, and build their confidence. The framework can also help build the capacity of vocational training centres to effectively integrate technology into their programmes, leading to scalability and wider impact. Ultimately, this study has the potential to empower adult learners to take control of their learning and development, leading to better outcomes for themselves and the broader society. By addressing the specific needs and challenges of adult learners in Zimbabwean vocational training centres, this study can make a meaningful contribution to the improvement of vocational education and training in the region.

A study carried out by Falloon (2020) indicated that over the years, a variety of frameworks, models and literacies have been developed to guide teacher educators in their efforts to build digital capabilities in their graduates. Such capabilities are envisaged to support learners to use new and emerging technologies in their future classrooms. Generally, these focus on advancing graduates' skills in using 'educational' applications and digitally sourced information, or understanding effective blends of pedagogical, content and technological knowledge seen as supporting the integration of digital resources into teaching, to enhance subject learning outcomes. Within teacher education institutions courses developing these capabilities are commonly delivered as stand alone entities, or there is an assumption that they will be generated by technology's integration in other disciplines or through mandated assessment. However, significant research exists suggesting the current narrow focus on subject-related technical and information skills does not prepare graduates adequately with the breadth of knowledge and capabilities needed in today's classrooms, and beyond. This article presents a conceptual framework introducing an expanded view of teacher digital competence (TDC). It moves beyond prevailing technical literacies and conceptualisations, arguing for more holistic and broader-based understandings that recognise the increasingly complex knowledge and skills young people need to function ethically, safely and productively in diverse, digitally mediated environments. The implications of the framework are discussed, with specific reference to its interdisciplinary nature and the requirement of all faculties to engage purposefully and deliberately in delivering its objectives. Practical suggestions on how the framework might be used by faculty are presented. The current study also contributed by developing a framework to enhance educational technology adoption by adult learners in Zimbabwean vocational training centres.

Mwembe et al. (2022) have noted the various needs facilitators and schools lack for effective teaching of science, technology, engineering, and mathematics (STEM) subjects, primary and secondary under-resourced rural schools. This survey was conducted from February 2019 to March 2019, in Lupane and Hwange Districts. A multi-stage sampling method was used for collecting data. Focus group discussions were also used in collecting data and were conducted before the issuance of questionnaires for completion by the participants. In analyzing data, the odds ratio (OR) was calculated to compare the relative odds between outcomes and variables of interest. The survey found that female facilitators were lagging in the uptake and training of teaching STEM subjects, which could be attributed to family responsibilities. It was established that some needs such as lesson delivery skills, research skills and capacitation were highly needed in primary schools as compared to secondary schools. While other needs identified were equally needed in both primary and secondary schools. These include but are not limited to conducting team teaching with other facilitators, linking topics and lessons across classes and lessons, application skills and STEM activities. It was highly recommended that primary and secondary school facilitators be funded to attend capacitation platforms in teaching STEM subjects for effective teaching in rural schools, and using locally available resources, since limited resources are the order of the day in rural schools. Schools must be equipped with tools and structures such as laboratories. If schools cannot build laboratories, it was recommended that mobile laboratories be established to improve the teaching of STEM subjects in under-resourced rural schools. One mobile laboratory can service many schools in the district and improve the pass rate of STEM subjects.

This study sought to develop a framework to enhance educational technology adoption by adult learners in VTCs in Zimbabwe, leading to improved access to quality education, increased efficiency, and enhanced engagement. By integrating technology into their learning, adult learners can develop new skills, become more competitive in the job market, and build their confidence. The framework will also enable vocational training centres to effectively integrate technology into their programmes, leading to scalability and a wider impact. Ultimately, this study aims to empower adult learners to take control of their learning and development, which

leads to better outcomes for themselves and the broader society, and contributes to the improvement of vocational education and training in the region.

2.7.5 Develop a framework for modern educational technology adoption

Abubakari and Zakaria (2023) highlighted that digital learning has become crucial to all education systems, particularly after the pandemic eruption. However, accepting digital technologies among students and teachers in Islamic education remains challenging.due to lack of a framework for modern educational technology adoption which is tailormade to their programmes. The Technology Acceptance Model (TAM) is a well-known model that explains digital technology acceptance among users. This conceptual study aims to suggest a theoretical model that integrates TAM with perceived Islamic education compatibility and perceived digital self-efficacy variables, known as the Technology Acceptance Model in Islamic Education (TAMISE). The review of related studies involved searching relevant literature published in various databases, including Web of Science, Google Scholar, and Scopus. Document analysis resulted in the conceptual model. The proposed TAMISE model is a conceptual model that integrates the TAM model with perceived Islamic education values to provide a framework for digital learning acceptance in Islamic education. The model suggests that perceived usefulness, perceived Islamic education compatibility, perceived ease of use, perceived digital self-efficacy, and behaviourall intention will predict digital learning acceptance in the Islamic education context. The TAMISE model can guide researchers and practitioners in designing and implementing effective digital learning acceptance in Islamic education. This study seeks to close the gaps of developing a framework to enhance educational technology adoption in VTCs in Zimbabwe which is relatively less developed compared to Islamic nations in question.

Al Kurdi, Alshurideh and Salloum (2020) assert that E-learning has gained recognition and fame in delivering and distributing educational resources, and the same has become possible with the occurrence of Internet and Web technologies. The research seeks to determine the factors that influence students' acceptance of e-learning and to find out the way these factors determine the students' intention to employ E-learning. A theoretical framework was developed based on the technology acceptance model (TAM). To obtain information from the 270 university students

who utilized the e-learning system, a questionnaire was formulated. The results revealed that "social influence, perceived enjoyment, self-efficacy, perceived usefulness, and perceived ease of use" are the strongest and most important predictors in the adoption of e-learning systems by students. The outcomes have practical implications for practitioners, lawmakers, and developers in effective e-learning systems implementation to improve ongoing interests and activities of university students in a virtual e-learning atmosphere. Recommendations for e-learning practices are given by the research findings, and these may turn out to be guidelines for the efficient design of e-learning systems. The current study seeks to develop a framework on educational technology adoption in Zimbabwean vocational training centres as compared to universities with a more improved setup in terms of technology.

Ngware et al., (2024) indicated that economic growth is dependent on well-skilled human capital. Technical and Vocational Education and Training (TVET) programmes are paramount in provision of the requisite capabilities which encompass both academic and non-academic skills also known as whole youth development (WYD) skills. Youths leaving training institutions in Kenya experience various challenges associated with skills gap including capacity to access, sustain and progress in the labour market. This article examines influencers of WYD skills acquisition among learners in the TVET institutions in Kenya. The article used data from a cross-sectional survey, targeting graduates aged 15–25 years in both public and private TVET institutions. The study analysed data from 3452 graduates, 347 instructors and 171 heads who participated in the study. A composite score based on four domains measured acquisition of WYD skills: functional numeracy and literacy, soft skills and digital learning. Multi-level regression results on WYD revealed better performance in well-equipped institutions compared to inadequately equipped ones. Similarly, better performance from institutions located in wealthier regions compared to those in marginalized areas. It was deduced that the uptake of WYD skills among TVET graduates heavily relied on supply-side influencers. The current study seek to assess the adequacy of adult learning strategies and identify areas that require improvement to promote lifelong learning Zimbabwean vocational training centres. To achieve this, the study will investigate the adult learning strategies used in higher education institutions, focusing on teacher-centred and learner-centred approaches. The researchers will also examine the challenges faced by educators in implementing lifelong adult learning strategies and provide

policy recommendations for effective lifelong adult learning. The ultimate goal is to develop a framework that addresses the gaps in adult learning strategies and promotes lifelong learning in vocational training centres. This will help ensure that adult learners acquire the necessary skills and competencies to succeed in their careers and adapt to the ever-changing job market. The researchers emphasize the importance of understanding adult learning strategies in promoting lifelong learning, which is critical in today's fast-changing world. They also highlight the need for educators to be equipped with relevant teaching strategies to produce highly innovative and problem-solving graduates.

Hameed (2022) in his study found that the use of Information and Communication Technologies (ICTs) in the 21st-century organisations had a great impact on the efficient management of operations, improved decision-making capabilities, leveraging competitive advantage, and facilitation of seamless integration and communication with key stakeholders. E-learning, which is premised on ICTs, has become a de facto standard mode of delivery in the face of the COVID19 pandemic. The purpose of the qualitative study was to review the Information Technology framework for University institutional performance and determine how technology was being integrated into the teaching/learning process in a university setting. It is envisaged to develop a technology roadmap for business administration in a university setting. In this research, a qualitative research methodology was used to fulfil the objectives of this study. The research design was mainly an evaluation and then supported by a brief case study. The research paper reviewed the IT integration framework premised on ten theories, namely, the Innovations Diffusion Theory; the Technology Acceptance Model (TAM); the Innovator's Solution Theory; the Unified Theory of Acceptance and Use of Technology (UTAUT); Resource Based Theory; Theory of Reasoned Action (TRA); the Technology-Organisation-Environment (TOE) framework; Benefits, organisational readiness and external pressure (BOE) model; the Theory of Planned Behaviour (TPB); and the Technological Pedagogical Content Knowledge (TPACK) framework. The IT integration framework was reviewed in the context of enhancing institutional performance of a university. The brief case study was conducted at selected national Universities to conclude the study. The current study managed to use two theories because using two theories instead of 10 during research offers several advantages, including a more focused and in-depth examination, clarity, depth, integration, manageability, specificity, theoretical saturation,

avoidance of theoretical overload, enhanced validity, and streamlined writing. By concentrating on two theories, researchers can explore each theory's nuances, relationships, and applications more thoroughly, leading to a more comprehensive understanding of the research phenomenon. This approach also enables the researcher to tailor her research more specifically to the research question and context, increasing the validity and impact of the study. Overall, using two theories allows for a more rigorous and meaningful exploration of the research topic, ultimately contributing to a deeper understanding of enhancing educational technology in Zimbabwean vocational training centres. The current study used mixed research methods because mixed methods research designs offer the advantages of both qualitative and quantitative approaches, enabling researchers to triangulate data, gain a comprehensive understanding of complex research questions, and quantify and qualify findings. This approach is particularly useful when addressing complex research questions, studying subjective experiences, and working with small sample sizes. However, the researcher chose not to use qualitative research designs because this is not a new topic, which can seek in-depth insights, or leverage methodological expertise.

Maune (2023) examined the adoption and use of e-Learning platforms by universities in Zimbabwe using the Delphi technique. Using the Delphi method, professionals in the area were asked for their in-depth opinions on how Zimbabwean institutions could embrace and utilise e-learning systems. ODeL specialists, academic consultants, university professors, and doctors made up a panel of 10 experts. When it came to the adoption and usage of e-learning platforms by institutions in Zimbabwe, four rounds of questionnaires were sent out one after the other to gain expert feedback. These questionnaires were derived from the Unified Theory of Acceptance and Use of Technology and the Theory of Planned Behaviour. Latent variables and measurement items in these theories served as the basis for the questions. The main findings of this study were that although e-learning is highly valued and well-known in Zimbabwe, nothing much has been done to embrace and use e-learning systems by the nation’s universities. Major obstacles holding back Zimbabwean universities’ adoption and use of e-learning platforms include slow or non-existent internet connection, high data costs, a lack of hardware and software options, and bad connectivity. Additionally, it has become abundantly evident that teachers and learners adopting and using e-learning systems is a planned behaviour. This study intends to resolve various ambiguities and gaps in Zimbabwean universities’ adoption and use of e-learning while also

informing policy design and implementation. The current study seeks to close the gap by using semi structured interview rather than delphi method because it needs structured, anonymous input from a group of experts, multiple rounds of feedback and refinement, focus on collective judgment and convergence, statistical summaries and anonymized comments and time-consuming and resource-intensive. Whereas interviews are one-on-one or small group conversations, direct, personal interaction with the respondent, flexible, open-ended questions and rich, qualitative data. The current study also addresses the gap on main findings from this empirical study by developing a framework which can enhance educational technology.

2.8 Research Gaps Analysis

Empirical review revealed that most related studies focused on technical vocational education and training activities rather than on the issue of adoption of educational technology in Vocational Training Centres in Zimbabwe. Most of these studies were carried out at regional and international level which becomes more difficult to relate their findings to the Zimbabwean context and particularly in VTCs thereby creating a huge gap which the current study sought to close.

In addition, most of the empirical studies focused on perspectives, challenges and factors affecting the adoption of educational technology in different institutions which was too broad and too general when compared to a framework towards adoption of educational technology specifically in vocational training centres. As such the current research pursued to plug this literature/evidence gap through adoption of educational technology in vocational training centres which in a sense would embrace the value of using educational technology.

Vocational training is responsible for educating a future workforce that will complement university-graduate employees. It usually focuses on manual skills such as baking, carpentry, plumbing, logistics and transport. With the high demand for digital and basic programming skills in the workforce, vocational institutions are already in corporating digital skills into their programmes to match workplace requirements. These include basic programming and coding competencies, human-robot interaction, voice control command systems, or virtual reality-based interactions with connected processes.

On the same note, the majority of the reviewed literature was carried out by foreigners for example, the one carried out in South Africa by Marti (2019) whose findings are different when compared to similar studies carried out by the citizen of that country. Therefore, the current study seeks to address this gap by adoption of educational technology in vocational training centres from Zimbabwean perspective researched by the citizen of Zimbabwe..

Likewise, the bulk of the empirical studies reviewed were carried out in developed countries where there were competent personnel, good infrastructure and good resources because of stable economies. This study sought to take a different course since Zimbabwe was a developing country with incompetent personnel, without enough resources as well as poor infrastructure, thereby addressing the existing theoretical and knowledge gap.

A noticeable time gap was also evident as some of these studies were conducted almost two decades ago; as far back as in 1999 and could no longer shed a proper light to the contemporary training in the vocational training centres in Zimbabwe. Hence, this research intended to fill in this time gap through revealing the much-needed adoption of educational technology in vocational training centres in light of the prevailing educational technology.

More so, this study sought to close a methodological gap by adopting a mixed-method approach to the adoption of educational technology through adult learning in Vocational training centres in Zimbabwe as most of the empirical studies utilized a single method. The mixed-method approach adopted in this study is deemed more efficient as one method may compensate the weaknesses of the other method as the data sets reinforce one another.

One research carried out looked at employers' perceptions of Technical vocational Education and Training activities in Zimbabwe. The current study sought to shade more light on the framework for adoption of educational technology in adult learning in VTCs in Zimbabwe. In a nutshell, the current study sought to close all identified research gaps regarding time, geography, evidence, knowledge, literature, methodology, theory and population.

2.9 Conceptual Framework

A conceptual framework provides an illustrative depiction of relationships between study variables (Makhamara, 2017, p. 28). According to Manduku (2015), as cited in Karani (2019, p.

46) “it is the process of making something by generating specific ideas that are designed to solve a problem or describe the relationship between interconnected ideas”. In this study, VTCs were the dependent variable and educational technology constituted the independent variables. The mediating variable was the business environment’s uncertainty dominant in the 21st century. Consequently, in this study, the researcher focused on adoption of educational technology in Vocational Training Centres in Zimbabwe.

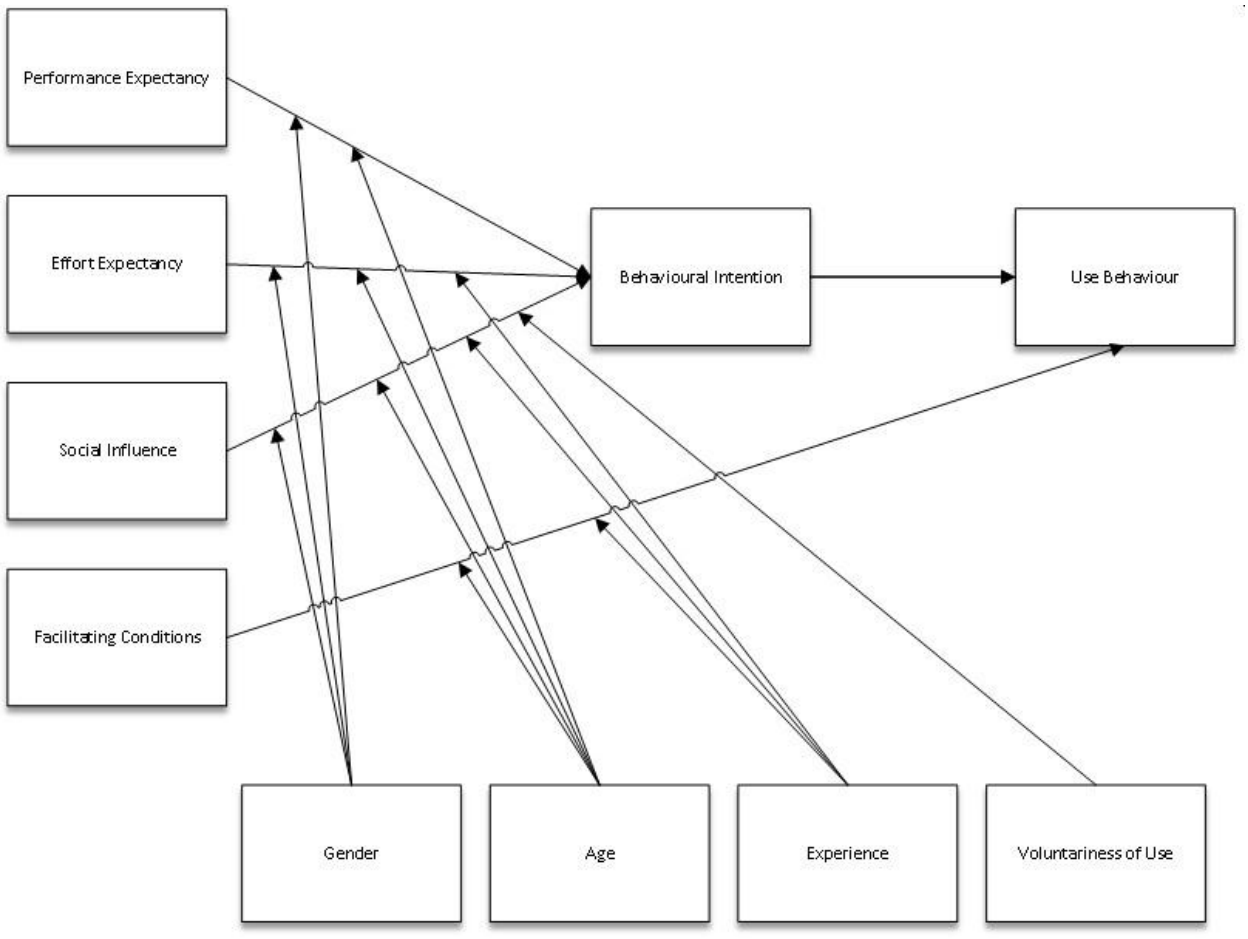


Figure 0.5: Conceptual Framework: Unified Theory of Acceptance and Use of Technology (Vankatesh, et, al., 2003, p. 472).

The moderation effects of age, gender, experience and voluntariness of use defined the strength of predictors on intention. Age moderated the effect of all four predictors. Gender affected the relationships between effort expectancy, performance expectancy and social influence. The

experience moderated the strength of the relationships among effort expectancy, social influence and facilitation conditions. Voluntariness of use has a moderating effect only on the relationship between social influence and behavioural intention (Venkatesh et al., 2003).

Vankatesh, et, al., (2003) made several contributions to the literature. The model provided empirical insight into technology acceptance by comparing prominent technology acceptance theories, which often offer competing or partial perspectives on the subject. UTAUT demonstrated that proposed factors account for 70 per cent of the variance in use intention (Venkatesh et al., 2003), offering stronger predictive power compared to the rest of the models that examined technology acceptance. The interactive effect of some constructs with personal and demographic factors demonstrates the complexity of the technology acceptance process, which is dependent on individuals' age, gender and experience (Venkatesh et al., 2003).

The adaptations of the model were underpinned by four main approaches, reflecting a) the modification of the model to different contexts, b) the alterations of the endogenous variables, c) the addition of attitudinal antecedents, and d) the examination of various moderating variables. The first stream of research extended the model to apply it to new technologies (e.g. enterprise systems, e-health systems), focus on new user segments (e.g., healthcare professionals), and examine it in new geographical and cultural settings. For instance, the model was extended by a set of web-specific constructs, including trust and personal web innovativeness to explore how well it predicted the use of web tools. Another stream of research extended UTAUT by incorporating additional endogenous variables, such as satisfaction and continuous intention to use (Maillet et al., 2015). The third stream of research scrutinised additional determinants of use and behavioural intention, such as task-technology fit and personality traits. Finally, some studies extended UTAUT by introducing new contextual and moderating variables, such as culture, ethnicity, religion, employment, language, income, education and geographical location, among others.

2.9.1 Educational Technology

Education technology, also known as 'EdTech' undoubtedly has become the central drive for the evolution of our education system. It has changed all aspects of education, and it has turned into an essential instrument for teaching and learning nowadays (Abbas, 2017). Furthermore,

technology has made the process of teaching and learning more effective and more enjoyable (Abbas, 2017). According to a recent report by Smooth Wall, a staggering 96% of teachers believe technology has had a positive impact on increasing the graduates' interest in studying and learning. Few surveys indicated that pupils were noticeably more engaged when technology was used (Ferrario & Stantcheva, 2022).

Ed-Tech or educational technology is a type of technology that facilitates learning and improves graduates' performance. It also can be defined as the use of technological processes and resources to improve education and facilitate the learning process. It includes numerous types of media that deliver text, audio, images, animation, video, satellite TV, CD-ROM, and technology applications, computer-based learning tools, as well as local intranet/extranet and web-based learning tools (Cormac & Anna, 2020).

Lazar Stošić (2019) defines educational technology as a systematic and organized process of applying modern technology to improve the quality of education (efficiency, optimal, true, etc.). It is a systematic way of conceptualizing the execution and evaluation of the educational process, i.e., learning and teaching, and helps by applying modern educational teaching techniques. It includes instructional materials, methods, and organisation of works and relationships, i.e., the behaviour of all participants in the educational process (Au Lazar, 2015).

The Australian Society of Educational Technology (2004) defines educational technology as the design application, evaluation, and development of systems, methods, and materials to improve the process of human learning. According to the Association for Educational as defined by the Communications and Technology Definitions and Terminology Committee (2010) and supported by Alan and Michael (2010), educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources.

The definition describes three major functions that are integral to the concept of educational technology: creating, using, and managing. According to the Association Committee, Educational Technology (AECT, 2004) encompasses all types of technologies used for the advancement of teaching-learning, not limited to software, hardware, as well as internet applications, such as Wikipedia, blogs, and others.

2.9.1.1 Advantages of Educational Technology

Educational technology assists in learning important subjects and increases graduates' interest as well as helps in understanding the scope of various subjects studied. It also allows educators to revise their content simply and quickly. Learners have control over the content, learning sequence, pace of learning, time, and often, media, which allows them to tailor their experience to meet personal learning objectives. E-technologies permit the widespread distribution of digital content to many users simultaneously, anytime and anywhere without carrying heavy textbooks or notebooks (Manya & Vishnu, 2018). A recent poll reveals that 75% of educators believe that digital content will replace textbooks by the year 2026 (Manya & Vishnu 2018). Indeed, technology has developed daily, which is very good in the educational aspects for graduates, and more remarkable technologies are on the way.

2.9.1.2 Influencing Educational Technology

Technology is increasingly influencing the core activities of education (Neetu, 2018). It shifts the role of the instructor from centralized education to the constructor of the learning environment and as an advisor to a learner. The reasons for this movement in the learning system are as follows:

i. Educational technologies allow teachers to spend less time giving whole-class lessons and more time meeting with graduates individually or in small groups to help them with specific concepts, skills, questions, or learning problems.

ii. It provides increased flexibility and access to learning experiences by allowing graduates to work independently and at their own pace and online. At the same time, teachers can structure courses and deliver instructions more flexibly and creatively than in a traditional classroom setting.

iii. It also allows the institution to teach more graduates more efficiently at a lower cost for both the institution and the graduates (Charles et al., 2020). Technologies also offer educators a new paradigm based on adult learning theory, which states that adults learn by relating new learning to past experiences, by linking learning to specific needs, and by practically applying learning technologies. Few studies indicate that the implementation of

technologies could help the graduates in doing their assessments more efficiently, effectively, and faster than through traditional instructor-led methods

2.9.1.3 EdTech and the Coronavirus-2019

The Coronavirus that ravaged the world in 2019 thrust EdTech into the spotlight. Schools and education systems around the world had no choice but to quickly adapt to deliver lessons using EdTech tools to support teaching. According to Barman, (2022) the peak of the coronavirus crisis, more than 90% of the world's schools, colleges, and universities were closed, and teaching was conducted online, using a combination of workplace and education technologies. These included Zoom, Google Classroom, and Microsoft Teams. By late April 2020, approximately 1.7 billion graduates studied remotely (Credit, 2020). According to (Alhaimer, 2024) 191 countries implemented nationwide closures, affecting approximately 98% of the world's student population (UNESCO).

2.9.2 Vocational training centres

A vocational training centre means any place or institution where vocational education provides training in specific trades, skills, or occupations Glazebrook (2015).

Vocational training refers to instructional programmes or courses that focus on the skills required for a particular job function or trade. In vocational training, education prepares graduates for specific careers, disregarding traditional, unrelated academic subjects. Sometimes called Vocational Education and Training or Career and Technical Education, vocational training provides hands-on, job-specific instruction, and can lead to certification, a diploma or even an associate's degree (Mohsin, 2022).

Vocational training can be described as training that emphasizes knowledge and skills needed for a specific trade, craft or job function. Earlier, this training was confined to certain trades like welding, automotive services, and carpentry but the horizon of vocational training has expanded with the evolution of time (Austin, 2022).

Vocational education is education and training that has a special emphasis on the skills, knowledge and attributes required to perform a specific role or to work in a specific industry. It

can span a variety of careers, including occupations such as barista, aged-care work and plumbing, and be delivered either in the workplace by employers to employees, with support from industry training organisations (ITOs), or through providers (such as institutes of technology and polytechnics (ITPs), and private training establishments (PTEs) (Scott, 2022). Therefore, Vocational Training is a process to build the future of an individual in a particular trade or craft activity. Earlier, it was only limited to fields such as welding and automotive service. However, with an enhancement in technology, we have seen an increase in the scope of vocational training.

2.9.2.1 Types of Vocational Training

According to Austin (2022), there are different types of vocational training. Some of them are mentioned in the list given below.

Internship

It is a training programme in which an individual gets to know their job. People who want to get hands-on training go for these internship programmes. It gives the desired experience in the chosen field of study.

i. Uses of Vocational Training Centres

Graduates typically require vocational training to prepare for trades including, but not limited to: Construction Industry; Manufacturing Sector; Food Service; Cosmetics and Hair Stylist and Computer and ITC Industry.

Technology improves itself due to globilisation on a regular basis. Therefore, a company always needs staff who can cope easily and quickly with the latest technology. One is of no use in the ITC industry if s/he is not able to tackle the daily problems or cannot match the pace of the technology. However, there are certain requirements to fit in the industry. Today, a wide range of job functions like retail training, tourism management, property management, food and beverage management, computer network management and floral designing are also being included under this category (Scott, 2022).

A vocational training model is required to reduce the socio-economic gap and to set professional standards by developing human resources trained in trades. The syllabus, activities and methodology proposed for the vocational training of the graduates at special education centres forthe disabled was agreed upon by the experts. It was recommended that a vocational training model on various jobs for specific disabilities may be developed (Majid, 2015).

ii. Importance of educational technology

Vocational training has become a necessity in today's world (Matthias & Regel, 2021). vocational education is training that teaches the practical knowledge of the subject. It is precisely meant for job opportunities. Graduates need to gets on-hands training which is given to them through the different vocational training programmes. People wonder why we should go for any extra vocational training when we have proper knowledge of our subject. However, this is where people are wrong in understanding the value of vocational training.

2.9.3 Business Environment

Accordingly, both internal and external environmental changes undoubtedly have a significant impact on the business activity of any organisation at both local and international level, thus impacting on adoption of educational technology in vocational training centres, as briefly set out below.

2.9.3.1 External Environment

The macro-environment consists of broad environmental factors that impact to a greater or lesser extent on most firms. In a sense, the PESTEL framework is adapted to identify how future trends within the political, economic, social, technological, ethical and legal environments might impact on organisations (Storey, 2016). This PESTEL analysis offers the extensive 'data' from which to spot key drivers of change. These key drivers can be utilized to build scenarios of possible futures. Accordingly, scenarios reflect how strategies might change venturing on the various ways during which the business environment might change (Robbins & Coulter, 2017).

For example, the legal environment comprises of the various laws enacted by governments, and vocational training centres have to comply with such statutes to prevent discrimination among

stakeholders on the grounds of sex, race, religion, or ethnicity. Such laws regulate the ways on how educational technology can be adopted (Pathan, 2017). Furthermore, the general economic conditions, economic policies, and various factors of production have a bearing on adoption of educational technology. For instance, use of internet, email, zooms, classes and video conferences (Cheteni, 2019; Pathan, 2017).

The global recession is slowing down the growth, increase in unemployment, which increases the demand for voluntary job seekers (Hewitt, 2015; Cheteni, 2019). On a social note, the generation Y poses a challenge to the strategic HRM; vis-à-vis the striking increase in the number of women in the labour force, As a result of these diversity issues in the labour force, vocational training centres should find various ways to adopt educational technology.

More so, technological changes are pressurizing businesses to become 'lean and mean', downsizing and reducing managerial and supervisory layers thereby becoming more strategic at all levels. In the vocational training centres, Pathan (2017) contends that the war for talent is on and the institutions must be equipped with different types of educational technologies to win this war and help themselves survive in the competitive environment by developing and retaining talent thereby creating a sustainable advantage.

2.9.3.2 Internal Environment

Contingency theorists resonate that the connection between the relevant independent variables (e.g., educational technology) and the dependent variable (e.g. vocational training centres) differs according to the influences such as firm size, age, technology, capital intensity, degree of unionization, sector ownership, and location (Dany et al., 2018; Cheteni, 2019). On the same note, Pathan (2017) identifies the following aspects of the internal environment as the main factors affecting the adoption of educational technology in every organisation: business strategy, organisational size, organisational structure, organisational culture, organisational power and politics, and top management and line manager's concern.

Equally, Armstrong and Taylor (2020) pinpoint the following facets of the internal business environment as the main factors that may hinder the adoption of educational technology: the type of business organisation – private, public or voluntary sector; manufacturing or service; the age

or maturity of the organisation; the level of technological advancement; the type of personnel employed; the organisation's culture - thus, the recognized assumptions, norms, attitudes, set of values, and beliefs which form how things are done.

In another study conducted in Saudi Arabia titled '*Strategic HRM and its Impact on Performance"* the subsequent were the most significant obstacles to the effective adoption of Strategic HRM practices: inadequate financing for HR projects; a lack of cooperation and coordination between HR managers and executive managers; and the absence of distinct HR departments (Altarawneh, 2016).

The following were the most significant obstacles to the effective adoption of educational technology in Vocational Training Centres: critical shortage of technology, workshops, materials and facilities to effectively use educational technology in most vocational training centres in Zimbabwe. These shortages were serious handicaps that needed to be addressed. The vocational training system in Zimbabwe generally needed resources and facilities for a successful adoption of educational technology (Wang et al., 2020).

The purpose of scanning business environment is used to support strategic planning in a vocational education and training system. It outlines the environmental domains that can impact on the organisation. Business environmental scanning activities can be organised into external and internal analysis. Finally, business scanning presents a model that is simple to understand and use in order to anticipate changes and to improve the quality of the planning and decision-making processes within a vocational education and training system.

2.10 Chapter Summary

This chapter reviewed related literature on the enhancement of technology adoption through adult learning in Vocational Training Centres as guided by the main research objectives. The literature gave an overview of the main works and provided a brief discussion of the most relevant literature which addressed the key research objective of the study. It also covers literature review on the theoretical framework, empirical review and conceptual framework which is related to enhancing technology adoption through adult learning in Vocational Training Centres.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The previous chapter dealt with literature review and this chapter addresses the research design, target population and sampling procedure. It also illustrates the research instruments used for data collection, analysis, presentation, and interpretation methods adopted for the study. Moreover, it outlines the study's reliability and validity and the ethical considerations.

3.1 Research philosophy

A research philosophy is an approach undertaken to guide research (Goundar & Kumar 2022). Field (2020) states that philosophy is concerned with the way in which knowledge is established and it further postulates the nature of the knowledge regarding the study. Research philosophy refers to the set of beliefs, assumptions, and values guiding the researcher's approach to conduct research (Creswell & Poth, 2022). This includes considering the research paradigm, methodology, and ethical considerations that underpin the research study (Bryman, 2022). Additionally, research philosophy involves reflecting on the nature of knowledge, reality, and truth, as well as the researcher's positionality and bias (Denzin & Lincoln, 2022). It addresses the researcher's worldview and influences on decisions regarding research design, methodology, data collection, and interpretation of results (Iyer et a.l., 2023). There are several commonly recognised research philosophies, each with its own underlying assumptions and characteristics. The three prominent research philosophies includes pragmatism, interpretivism and positivism.

Positivism is based on the belief that knowledge can be obtained through objective observation, measurement, and the application of scientific methods. Positivist researchers strive for objectivity and aim to uncover general laws and causal relationships. They typically use quantitative methods and favour large-scale surveys, experiments, and statistical analysis (Sanchez et al., 2023).

Interpretivism, also known as constructivism or anti-positivism, emphasise the subjective understanding of nterpretivist researchers, the importance of social phenomena and context, and

utilizes qualitative methods like interviews, observations, and textual analysis to explore multiple perspectives, meanings, and subjective experiences (Hesse-Biber, 2022).

Pragmatism acknowledges the value of both positivist and interpretivist approaches and emphasises the need to select research methods based on their practical utility and ability to answer research questions effectively. According to Maarouf (2019), pragmatist researchers prioritise the use of mixed methods, combining quantitative and qualitative approaches, to gain a comprehensive understanding of the research topic. It is important to note that these research philosophies represent broad categories, and researchers may adopt a combination of approaches or draw from other philosophical perspectives based on their specific research goals. The choice of research philosophy should align with the research questions, the nature of the phenomenon under investigation, and the researcher's epistemological and ontological beliefs.

By understanding and explicitly stating their research philosophy, researchers can provide a clear framework for their study, justify their methodological choices, and enhance the transparency and rigour of their research. The selection of research philosophy depends on the assumptions about the way the researcher understands the world (Otieno, 2023). According to Creswell (2018), combining qualitative and quantitative approaches through mixed methods research can yield richer insights. By integrating both qualitative findings and quantitative results in a thoughtful manner, researchers can uncover deeper meanings and gain a more comprehensive understanding of the data. Researchers concur that a research philosophy reflects the researcher's belief on how the research should be done, and this has an impact on the method adopted for analysis (Amadi, 2023; Bell et al, 2022; Maarouf, 2023; Saunders, 2022). A research philosophy is a fundamental aspect of research design, as it influences the researcher's decisions regarding data collection, analysis, and interpretation (Merriam, 2022). It encompasses the researcher's worldview, assumptions, and values, which shape their approach to research (Creswell & Poth, 2022). Research philosophies are critical to the creation of knowledge which gives an insight into the real-world situations (Al-Ababneh 2020; Geels et al., 2023).

This study adopted the Explanatory Sequential design. The Explanatory Sequential design is a research approach that combines quantitative and qualitative methods in a two-phase approach (Creswell, 2022). Initially, quantitative data is collected and analysed to provide a broad

understanding of the research phenomenon (Bryman, 2022). Qualitative data is collected and analysed to provide a more in-depth understanding and to explain or interpret the quantitative results (Merriam, 2022). This design enables researchers to triangulate data, increasing validity and reliability (Saunders, 2022), and is particularly useful for exploring complex research questions, testing hypotheses, and providing a nuanced understanding of the research context (Gray, 2022).

The Explanatory Sequential Design process is carried out in two distinct interactive phases. It begins with the collection and analysis of quantitative data in the first phase, the results of which inform the design of the second, qualitative phase (Creswell & Clark, 2018; Shorten & Smith, 2017). The researcher investigates a specific quantitative finding and unpacks it using qualitative data (Wilkinson & Staley, 2019). The quantitative data is prioritised, and the findings are integrated during the study's interpretation phase. For example, once the critical features of the COVID-19 pandemic that have contributed to lecturers and graduates adopting digital technologies have been established through quantitative data analysis, interviews are conducted to delve deeper and explain this phenomenon. The qualitative phase helps explain specific quantitative findings in more detail (Wilkinson & Staley, 2019. Finally, the quantitative results are summarized and interpreted.

The Explanatory Sequential Design is a research approach that combines the strengths of quantitative and qualitative methods (Creswell, 2022). It involves a two-phase sequence, where quantitative data is collected and analysed first, followed by qualitative data collection and analysis (Bryman, 2022). This design enables researchers to explore complex research questions, test hypotheses, and provide a nuanced understanding of the research context (Merriam, 2022). By integrating both quantitative and qualitative approaches, the Explanatory Sequential Design offers a comprehensive and detailed understanding of research phenomena (Gray, 2022; Saunders, 2022).

The Explanatory Sequential Design is a mixed-methods approach that combines the strengths of both quantitative and qualitative methods (Creswell, 2022). This design is particularly useful when researchers aim to explain or interpret the results of a quantitative study through subsequent qualitative data collection and analysis (Bryman, 2022).

In the first phase, quantitative data is collected and analysed to identify patterns, trends, or correlations (Merriam, 2022). This phase is followed by a qualitative phase, where data is collected and analysed to provide a more in-depth understanding of the research phenomenon (Gray, 2022). The qualitative phase can involve interviews, focus groups, or observations, allowing researchers to gather rich, contextual data that can help explain the quantitative findings (Saunders, 2022).

The Explanatory Sequential design offers several advantages, including the ability to triangulate data, increase validity and reliability, and provide a more comprehensive understanding of the research topic (Creswell, 2022). By integrating both quantitative and qualitative approaches, researchers can address complex research questions and gain a deeper understanding of the phenomenon under investigation (Bryman, 2022).

The Explanatory Sequential design is a mixed-methods approach that prioritizes the practical application and usefulness of research findings (Creswell, 2022). This design is particularly useful for generating research outcomes that are relevant, applicable, and actionable, thereby increasing the potential for findings to inform decision-making, policy development, or practical interventions (Bryman, 2022).

By employing a two-phase sequence, researchers can first identify quantitative patterns and trends, followed by an in-depth qualitative exploration of the research phenomenon (Merriam, 2022). This design enables researchers to address complex research questions, test hypotheses, and provide a nuanced understanding of the research context, ultimately leading to more informed decision-making and practical applications (Gray, 2022).

The Explanatory Sequential design is particularly useful for evaluating programmes, policies, or interventions, as it allows researchers to assess the effectiveness and impact of these initiatives (Saunders, 2022). By integrating both quantitative and qualitative approaches, researchers can generate a comprehensive understanding of the research topic, including its practical implications and real-world impact (Creswell, 2022).

The Explanatory Sequential design is a mixed-methods approach that aligns with the pragmatic philosophy's emphasis on problem-solving and practical resolution of real-world issues

(Creswell, 2022). This design is particularly useful for addressing complex research questions and testing hypotheses, with a focus on generating solutions that can make a positive difference (Bryman, 2022).

By employing a two-phase sequence, researchers can first identify quantitative patterns and trends, followed by an in-depth qualitative exploration of the research phenomenon (Merriam, 2022). This design enables researchers to address practical problems and challenges and seek solutions that are relevant and useful to stakeholders (Gray, 2022).

The Explanatory Sequential design is particularly useful for evaluating programmes, policies, or interventions, as it allows researchers to assess the effectiveness and impact of these initiatives (Saunders, 2022). By integrating both quantitative and qualitative approaches, researchers can generate a comprehensive understanding of the research topic, including its practical implications and real-world impact (Creswell, 2022).

3.2 Research paradigm

Research paradigm refers to the broad plan for the study in which steps, procedures and assumptions for data collection, analysis and interpretation are given (Sebele-Mpofu, 2020; Vogl 2023 & Zachlod et al., 2022). In their research onion diagram, Saunders, Lewis, and Thornhill (2009) as supported by Al-Ababneh (2020), İlhaBalyalı and Aktaş (2022) and Ghazinoory and Aghaei (2023) relied on two approaches to a research study namely deductive and inductive approaches. However, in the context of the Explanatory Sequential design, researchers employ a mixed-methods approach that combines both deductive and inductive reasoning (Creswell, 2022; Bryman, 2022).

This design begins with a quantitative phase, where data is collected and analysed through a deductive approach (Merriam, 2022). The findings from this phase inform the development of a qualitative phase, where data is collected and analysed through an inductive approach (Gray, 2022). This allows researchers to move from general observations to specific insights and practical solutions (Guzzo, Schneider & Nalbantian, 2022).

Through the Explanatory Sequential design, researchers can address complex research questions and test hypotheses, while also generating practical solutions and interventions (Wulff et al.,

2023). This design is particularly useful for evaluating programmes, policies, or interventions, and is well-suited for researchers adopting an Explanatory Sequential Philosophy (Creswell, 2022).

3.3 Research Design

Montgomery (2022) defines a research design as a blueprint that answers to the research objectives in any research. According to Creswell (2022), Bryman (2022), and Merriam (2022), a research design provides guidelines for gathering, analysing, and interpreting results, enabling researchers to conclude causal relationships among variables. The Explanatory Sequential design is a mixed-methods approach that combines quantitative and qualitative methods to address complex research questions (Gray, 2022; Saunders, 2022).

This design begins with a quantitative phase, followed by a qualitative phase, allowing researchers to explain and interpret the results in depth (Guzzo Schneider & Nalbantian, 2022). The Explanatory Sequential design is particularly useful for evaluating programmes, policies, or interventions and is well-suited for researchers adopting a pragmatist philosophy (Creswell, 2022).

In the context of the Explanatory Sequential design, researchers can use descriptive statistics and inferential statistics as data analysis tools (Wulff et al., 2023). This design also allows for the incorporation of both qualitative and quantitative forms of data, enabling a detailed description of the variables under study (Obermayer et al., 2022).

3.4 Target population

Pandey and Pandey (2021) define a study population as the total collection of elements about which the researcher would want to make inferences. Wang and Cheng (2020) defined population as people with common characteristics that make up a well-defined group from which the researcher can gather data. In their definition, Norman et al., (2021) described population as units of the study from which the researcher intends to make detailed analysis and conclusions. Defining the target population is a crucial step in the research process, and it should be done as soon as the sampling decision is made (Rahi, 2017; Gray, 2022). A proper definition of the population enables researchers to identify the appropriate sources from which data may be

collected (Creswell, 2022). This is supported by current researchers such as Bryman (2022) and Merriam (2022), who emphasize the importance of clearly defining the target population to ensure that the sample is representative and the data is generalisable (Bryman, 2022; Merriam, 2022).

Asvio (2022) asserts that it is a requirement for any research to state and maintain the target population from which results would be drawn. Therefore, the target population for this study consisted of 4000 respondents drawn from five Vocational Training Centres in Zimbabwe which included 790 graduates at each centre who took various courses at different vocational training centres in Zimbabwe, and 10 lecturers and staff at every centre at these different vocational training centres were also considered for their role and expertise in the adoption of educational technology in vocational training as indicated in Table 3.1 on the population framework below.

Table: 3.1 Population Framework: 4000

Institution	Type	No. of graduates	No. Lecturers/ Staff
Chitungwiza	Vocational Training Centre	790	10
Ruwa	Vocational Training Centre	790	10
Mt Hampden	Vocational Training Centre	790	10
Mushagashe	Vocational Training Centre	790	10
Masvingo urban	Vocational Training Centre	790	10
Total			4000

Source: Primary data, 2024

3.5 Sampling and Sample size

Huber and Helm (2020) defined sampling as the process of surveying only few and selected elements to make inferences about a population. Sampling is a procedure of choosing models

from a collection or population to become the basis for approximating and forecasting the result of the populace as well as to spot the unknown portion of information (Liu et al., 2022; Murray-Watters et al., 2023). A sample is a subset of individuals selected to represent a total population (Majone & Bellin, 2022). When carrying out research, it is not feasible to study the entire population due to cost and time constraints (Bull et al., 2020). Vahdat (2022) posit that a researcher may only use a part of the total population when making inferences about the populace. Borenstein (2022) further conclude that the researcher may conclude basing on estimation of the true picture of the population drawn from a small portion of the total population. The idea behind sampling is that it may not be possible to access all elements of the population due to time constraint (Braun & Clarke, 2021). Furthermore, sampling provides dependable and precise results as compared to a census which is prone to errors due to huge volumes of work involved. Leja et al., 2022 are of the opinion that it is easy to monitor and manage a small team as compared to working with a large group or working with the whole population.

Determination of a sample size that is appropriate for a research study is debatable amongst scholars, nonetheless researchers agree that a sample should sufficiently represent the population (Hair & Alamer, 2022; HR & Aithal, 2022). A larger sample may be used to reduce the likelihood of low response rate (Amer et al., 2022). The researcher considered determinants of sampling and sample size as stressed by Gray (2022), Creswell (2022), and Bryman (2022). These researchers emphasize the importance of careful consideration of sampling and sample size to ensure the quality and generalizability of research findings.

The sampling procedure was completed by randomly choosing 80 graduates from different departments at Vocational Training Centres to respond to the research study instrument. On the other hand, purposive sampling technique was used to select interviewees for the study. With purposive sampling, participants who possessed certain qualities were deliberately selected. According to Gumede and Badriparsad (2022), information was solicited from people who had in-depth understanding and experience of the subject under study (Biney, 2018). With this understanding, purposive sampling was used to choose the top five commanders at vocational training centres. In coming up with the sample, the study adopted the sample size formula as proposed by Creswell (2022):

$n = (Z^2 * \sigma^2) / E^2$

Where n = sample size,

N is the population size = 4000

X = Zα/22 * p * (1-p) / MOE2, where:

- Zα/2 is the critical value of the Normal distribution at 95% confidence level (1.96)

- α is 0.05

- MOE is the margin of error (5%)

- p is the sample proportion (85%).

Therefore, the study used a sample of 400 participants including five principals from Vocational Training Centres and 80 graduates from each of the five vocational training centres in Zimbabwe. On the other hand,10 participants were purposely sampled to provide qualitative data for the study.

3.6 Sampling Procedures

HR and Aithal (2022) submitted that sampling falls into probability sampling (stratified, systematic, simple and random cluster sampling) and non-probability sampling (judgemental/purposive sampling, quota sampling, and convenience sampling) (HR & Aithal, 2022). Bolinger et al., (2022) and Dwivedi et al., (2023) assert that the choice of a sample design is influenced by the advance knowledge of participants under consideration, degree of accuracy as well as the availability of resources (Bolinger et al., 2022; Dwivedi et al., 2023). Probability sampling affords every participant within each population an equal chance to be selected (Reisner & Hughto, 2019; Abenawe, 2022). Pandey and Pandey (2019) and Baltes and Ralph (2022) further claim that probability sampling is one of the methods that can be used to show a true sample which represents a total population (Pandey & Pandey, 2019; Baltes & Ralph, 2022).

Non-probability sampling methods are based on researcher judgment (Berndt, 2020; Baltes & Ralph, 2022; Hasniati et al., 2022; Karame et al., 2023). However, non-probability sampling may

lead to bias and misrepresentation of findings (Shortt et al., 2021; Radford et al., 2022; Toyon, 2023). Some researchers argue that non-probability sampling is practical and feasible due to time and cost constraints (Lehdonvirta et al., 2021; Purwanto, 2022; Claudia & Wijaya, 2023; Yang et al., 2020; Raifman et al., 2022; Murray-Watters et al., 2023). Non-probability sampling techniques, including purposive, convenience, and quota sampling, involve non-random practices such as researcher judgment and convenience selection (Baltes & Ralph, 2022; Winton & Sabol, 2022; Vadakedath & Kandi, 2023; Pace, 2021; Stark et al., 2023). In this study, the researcher employed judgmental sampling, a type of non-probability sampling, to select vocational training centre principals as participants. The researcher employed judgmental sampling, a type of non-probability sampling, to select vocational training centre principals as participants. This approach was likely chosen because principals possess specialized knowledge and experience, making them valuable sources of information. Additionally, their leadership positions may have made them easier to access. The researcher may have also selected principals with specific characteristics or perspectives relevant to the study, allowing for in-depth exploration of their experiences and opinions. While judgmental sampling can be time-efficient and provide rich insights, it can introduce biases, such as selection bias, information bias, and confirmation bias. To mitigate these biases, the researcher could have used techniques like triangulation, member checking, and thick descriptions to increase the credibility and trustworthiness of the findings.

Judgmental sampling is based on the impression that respondents must conform to specified criteria (Alagarsamy & Solaikutty, 2021; Buckingham et al., 2022; Jiang & Li, 2023). The researcher selects participants who can provide the most desirable or best information to meet study objectives (Norman et al., 2021; Alshurideh et al., 2022; Jiang & Li, 2023). According to Norman et al., (2021), Pellicano and den Houting (2022), Tuan (2023), and Dwivedi et al., (2023), the researcher focused on individuals with similar views who were willing to share required information. Judgmental sampling involves selecting participants based on the study purpose, with the hope that each member provides rich and distinctive information significant to the study (Baltes & Ralph, 2022; Lorette, 2023).

Isensee et al., (2021), Pang et al., (2022), and Lorenz-Spreen et al., (2023) agreed that the selection of the sampling technique depends on the nature and type of study. The researcher

opted for judgmental sampling, based on recommendations by Bergen and Labonté (2020), Lee et al., (2022), and Foster and Talley (2023), which allows for deliberate choice of respondents due to their qualities. The researcher selects respondents who possess the required information and are willing to share it (Ruuska, 2020; Weerabahu et al., 2022; Santhanam, 2023).

Judgmental sampling involves identifying and selecting participants who are well-informed and proficient in interest (Couch et al., 2021; Nishii & Leroy, 2022; Donegan et al., 2023). Huang et al., (2020), Vásquez-Pauca et al., (2022), and Zickar and Keith (2023) emphasized that judgmental sampling focuses on participants with specific characteristics who can contribute relevant information. However, the researcher used probability sampling to select current graduates from departments within each vocational training centre to participate in the study. The researcher used stratified random sampling, which is a type of probability sampling. Stratified random sampling involves dividing the population into subgroups or strata, and then randomly selecting participants from each stratum. By using stratified random sampling, the researcher aimed to ensure that the sample was representative of the population, which is essential for generalisability. However,it is important to note that sampling procedures can be complex, and details may vary depending on the specific study. Additional information about the sampling procedures would be necessary to fully evaluate the representativeness of the sample.

3.7 Research instruments

The instrument should be carefully thought out and based on research objectives and questions (Rashid et al., 2019; Ruslin et al., 2022; Fatimah et al., 2023). Appropriate instruments were required if desired and valid feedback was to be derived which gives consistence and accurate information. The main research instruments which were used in this study are: questionnaires, observation and interviews.

At the VTCS, the researcher observed graduates sharing computers and working in pairs/groups to complete tasks due to the limited number of computers available. Instructors were seen using alternative teaching methods, such as lectures or paper-based activities, to compensate for the lack of computers. Some graduates used personal devices, like smartphones or tablets, to supplement their learning. However, inadequate computer skills or knowledge among graduates and instructors hindered the learning process. The researcher also noted limited digital resources

and online materials, leading to creativity and resourcefulness among graduates and instructors in finding ways to work around computer limitations. Despite these efforts, frustration and disappointment were evident among graduates due to the lack of access to computers, highlighting the need for equitable and adequate computer resources to support effective learning.

Research instruments are tools used to collect data from respondents (Upoalkpajor & Upoalkpajor, 2020; Sharma & Kumar, 2022; Nsabayezu et al., 2023). According to Creswell and Creswell (2017), Pandey and Pandey (2021), Fernando et al., (2022), and Qerimi et al., (2023), there is no single data collection method that can sufficiently cover all dimensions of a complex research statement. For this study, the instruments used for collecting data were self-administered structured questionnaires (for quantitative data) and semi-structured interview guide and observation (for qualitative data). A questionnaire was designed for graduates at vocational training centres, while a semi-structured interview guide and observation guide were also prepared for lecturers at Vocational Training Centres for the purposes of obtaining quantitative and qualitative data respectively.

3.7.1 Structure of the questionnaire and administration

According to March (2020), Nearing et al., (2022) and Dowling and Lucey (2023) the research instrument should be kept as clear and simple as possible and should be of reasonable length. Hence the structure of the questionnaire used in this study was kept clear and simple to allow full participation of the respondents. The questionnaire consisted of a total of 22 questions that were predominantly semi-structured, closed-ended and with a few open-ended questions. According to Alvarez et al., (2019), Ferrario and Stantcheva (2022), and Menken and Toepoel (2023) structured questions provide respondents with options in answers, thus making it easier and faster for respondents to complete the questionnaire. It is also proposed that structured questions reduce non-response errors and above all, they are easy to code and analyse. A few open-ended questions were inserted in the questionnaire to invite respondents to express diverse views and perceptions on variable issues concerning some of the research aspects. The structured questions consisted of dichotomous, multiple choice and a five Likert-point type questions. Dichotomous questions offer only two answers, whereas multiple choice questions have more than two

answers to choose from. With the five-point Likert-scale, respondents are required to indicate the degree of their agreement or disagreement with the given question or assertion (i.e., 1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, 5 – strongly agree). The use of the Likert-scale standardises responses and make it easier for the researcher to code the data for quantitative analysis (see sample questionnaire in Appendix 'B' page 241).

The research questionnaire accompanied with an introductory cover letter, explaining the purpose of the research and clarifying pertinent ethical issues, was self-administered to three hundred and sixty-five (365) graduates, thirty-five (35) staff and lecturers to make a total of four hundred participants/respondents across five (5) Vocational Training Centres (Ruwa, Chitungwiza, Mt Hampden, Masvingo Urban and Mushagashe). The drop and pick system together with electronic mailing system were applied to ensure a higher response rate. Research has shown that self-administered questionnaires can achieve response rates of 30-50% (Wolters & Berinsky, 2022; Sibanda et al., 2023), which is relatively high in quantitative surveys. The researcher selected 35 lecturers from five vocational training centres using purposive sampling, ensuring diverse representation across college type, gender, qualifications, and programmes offered. To account for differences among lecturers, the researcher used stratified sampling, controlled for variables, and employed weighting techniques to ensure the sample was representative of the population. Subgroup analysis was also conducted to identify patterns and differences among lecturers. This approach enabled the researcher to capture a range of perspectives and increase the validity of the findings.

3.7.2 Structure of the interview guide and observation guide

Semi-structured interview questions were crafted for participants from the five vocational training centres. Interview questions were structured in such a way that they were easier to respond to yet in-depth enough to cover the essential areas of the study (see sample interview guide and observation guide in Appendix 'C' page 251).

The participating principals at Vocational Training Centres were visited at their physical business addresses. Before getting access to an interview with anyone, the general rule with the participating organisations was that the researcher had to formally seek for clearance from the top management. Official letters accompanied by the Chinhoyi University of Tchnology research

approval letter were tendered to the five vocational training managers who in turn cleared the researcher. The principals were informed about the researcher's request for their assistance. Once permission was granted, the researcher sought appointments with the participants. Appointments were reserved in three ways face-to-face, telephone and emails. Interviews were conducted through face-to-face interaction. Responses given were recorded through an audio voice recording device. The interviewer also took down notes while the interview was going on.

3.8 Sources of data

Research has identified two main data sources: primary and secondary sources (Cappa et al., 2022; Reshi & Sudha, 2023; Mhlanga & Moloi, 2020). These two classes of data can be used together to complement each other (Ferri et al., 2020; Douaud et al., 2022; Lan, 2023).

3.8.1 Primary data

This study collected primary data using semi-structured questionnaires (for quantitative data) and a semi-structured interview questionnaire (for qualitative data). According to Bastos et al., (2020), Prabhakar et al., (2022), and Kavitha et al., (2023), primary data are collected at a specific point in time for a specific purpose, which gives this type of data the advantage of being more relevant and having a higher degree of accuracy for the study at hand. However, the major drawback of primary data is that it is comparatively more expensive to gather and requires more time to put in place (Bastos et al., 2020; Prabhakar et al., 2022; Kavitha et al., 2023).

Demographic data from study respondents and participants were collected. Furthermore, data on vocational training, including productivity metrics, were also gathered. Additionally, data on the adoption of educational technology by graduates at vocational training centres were acquired for the study. Finally, the opinions of principals from vocational training centres regarding the adopting educational technology in these centres were also collected.

3.8.2 Secondary data

Secondary data, which refers to existing data collected for other purposes, were utilized in the current study (Linneberg & Korsgaard, 2019; Antoniadis et al., 2022; Lutfi et al., 2023). Although primarily gathered and processed by others to address different research questions,

secondary data offered the advantage of being readily available and accessible at a low cost (Grifoni & Guzzo, 2020; James et al., 2022; Voung et al., 2023). However, since secondary data were not project-specific, they may not fully address the current research objectives (Wang, 2019; Tavakolan et al., 2022; Tlili et al., 2023). To complement primary data, secondary data were also employed in the current study.

3.9 Validity and reliability of research instruments

The validity and reliability of a research instrument are crucial in assessing its goodness of measure, which is essential for enhancing scientific quality in cross-sectional design research (Paudel, 2019; Yeong et al., 2022; Aboudahr & Saidin, 2023). Validity concerns the accuracy of measuring the intended concept, while reliability pertains to the consistency and stability of measurement (McDonald et al., 2019; Alshurideh et al., 2022; Kabir et al., 2023). As emphasized by Bloomfield and Fisher (2019), Somani et al., (2022), and Barker (2023), validity in quantitative research ensures that the researcher can confidently conclude that their interventions affected outcomes without external influences. In contrast, reliability refers to the reputation of the results generated by a research instrument (Westreich et al., 2019; Rose & Johnson, 2020; Pimenovn et al., 2022; Iyer et al., 2023). This section explores the issues of validity and reliability related to the current study.To enhance the validity and reliability of the questionnaire, the researcher took several measures. Construct validity was ensured by reviewing literature and consulting experts, while content validity was established through a thorough literature review and piloting the questionnaire. Face validity was also confirmed through piloting with a small group of participants. Additionally, internal consistency was assessed using Cronbach's alpha, and test-retest reliability was evaluated by administering the questionnaire to a small group at two different times.

To address data trustworthiness issues for qualitative instruments, the researcher ensured credibility through triangulation, transferability through detailed descriptions of the research context, dependability through documentation of the research process, and confirmability through member checking and peer debriefing. By taking these steps, the researcher aimed to increase the accuracy, consistency, and transparency of the study's findings, ultimately strengthening the validity and reliability of the results.

To enhance the validity and reliability of the questionnaire, the researcher employed question replication, as piloting was not feasible. For instance, Almutairi et al. (2022) utilized cognitive interviewing to improve the validity of a health-related quality of life questionnaire. Chen et al. (2020) examined the effectiveness of expert review and pilot testing in enhancing the validity of a patient satisfaction questionnaire. Kumar et al. (2022) applied item response theory to improve the validity and reliability of a mental health symptoms questionnaire. These studies demonstrate ongoing efforts to refine methods for enhancing questionnaire validity.This involved using multiple questions to measure the same construct, allowing for internal consistency checks and ensuring that the questions were measuring the intended concepts. Additionally, the researcher ensured content validity by reviewing relevant literature and consulting with experts to ensure that the questionnaire covered all relevant aspects of the research topic. While piloting was not possible, the use of question replication and content validation helped to strengthen the validity and reliability of the questionnaire. Furthermore, the researcher took steps to address data trustworthiness issues for qualitative instruments, including ensuring credibility, transferability, dependability, and confirmability through various techniques. By taking these steps, the researcher aimed to increase the accuracy and consistency of the study's findings.

3.10 Data presentation and analysis

Data presentation and analysis involve reducing data into summaries and deductions through the application of statistical techniques (Aldaihani, 2022; Braun & Clarke, 2022; Pearlman, 2022; Fraser et al., 2023). According to Haven and Van Grootel (2019), Moncrieff et al,. (2022), and Wang et al., (2023), data analysis entails interpreting research findings in relation to the research questions and checking whether the findings align with the research hypotheses. In the current study the data was analysed using SPSS (Version 23.0), a statistical software package (IBM Corp., 2020). Descriptive statistics, including means, standard deviations, and frequencies, were calculated to summarize the demographic characteristics of the participants (Field, 2020). To examine the relationships between variables, Pearson's correlation coefficient (r) was used (Cohen, 2020). Additionally, one-way ANOVA, was conducted to compare means between groups (Glass & Hopkins, 2020).

Furthermore, exploratory factor analysis (EFA) was performed to identify underlying patterns and structures in the data (Bartlett, 2020). The principal component method was used for extraction, and Varimax rotation was applied to simplify the factor structure (Kaiser, 2020).

The qualitative data obtained in this study were analysed using narrative analysis, an interpretive approach to analysing qualitative data (Chmielewski & Kucker, 2020). Specifically, narrative analysis was employed to examine the content from interviewees, where stories and experiences shared by study participants were used to address the research questions. Verbatim quotes from open-ended questionnaire items and follow-up interviews were captured and analysed to gain a deeper understanding of the participants' perspectives. NVIVO 13 (2021) was employed for coding and analyzing the qualitative data (Bazeley & Jackson, 2021). The researcher began by importing the transcribed interviews into NVIVO and creating a new project (Hesse-Biber & Leavy, 2020). Then, they developed a coding framework based on the research questions and literature review (Saldana, 2021).

The researcher used NVIVO's coding tool to assign codes to relevant segments of the data, such as phrases, sentences, or paragraphs (Gibbs, 2021). They applied both descriptive coding (e.g., "leadership style") and interpretive coding (e.g., "transformational leadership") to capture the nuances of the data (Braun & Clarke, 2021). NVIVO's auto-coding feature was utilized to quickly apply codes to large sections of data, which were then reviewed and refined manually (Welsh, 2021). The researcher also used NVIVO's coding comparison tool to identify patterns and inconsistencies in the coding (Creswell & Poth, 2021).

As coding progressed, the researcher developed a set of themes and subthemes, which were organized using NVIVO's node system (Hatch, 2021). This allowed for easy visualization and exploration of the data. Throughout the coding process, the researcher maintained a coding journal to document decisions, reflections, and insights (Birks & Mills, 2021). This ensured transparency and trustworthiness in the analysis.

The quantitative data underwent coding, entry, and descriptive analysis using SPSS version 23.0. Descriptive statistics, including percentages, frequencies, mean scores, and standard deviations, were calculated and presented for various variables. Correlation analysis was performed to examine the relationships between variables identified in the conceptual framework.

Additionally, one-way ANOVA and independent t-tests were conducted to investigate the relationships between educational technology-related factors and vocational training centres. A multiple linear regression analysis was also performed to determine the statistical relationship between the independent variable (educational technology) and the dependent variable (vocational training centres). The study hypothesised that educational technology would have a significant impact on vocational training centres. The study hypothesised that:

$$\gamma_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \varepsilon$$

Were.

γ represents the adoption of educational technology to enhance adult learning in vocational training centres, measured in terms of productivity.

X_1 represents educational technology.

X_2 represents vocational training centres.

X_3 represents adult learning.

β_0 represents the constant.

Whereas β_1, β_2, β_3 and represent the co-efficient of regression for educational technology impact, and vocational training centres respectively. ε is an error term.

3.11 Ethical considerations for the study

Research ethics are essential in governing scientific research at institutions like universities, ensuring the protection of participants and maintenance of research integrity (David & Resnick, 2020; Kok et al., 2022; Zarnkow & Sierksma, 2023). Ethical issues are crucial when gathering data through questionnaires, as they involve invading respondents' privacy (Pal et al., 2021; Gonzalez et al, 2022; da Silva et al., 2023). Researchers must prioritise protecting participants, building trust, promoting research integrity, preventing misconduct, and addressing new challenges (Harriss et al., 2019; Morgan, 2022; Zhuo et al., 2023). Ethical norms and standards are vital to prevent harm or adverse consequences for participants (Hillerbrand & Werker, 2019;

Bordas et al., 2022; Kok et al., 2023). Common ethics transgressions include harm to participants, lack of informed consent, invasion of privacy, and deception (Bos, 2020). To deal with these ethics issues the researcher adopted the following measures:

In social science research, harm can manifest as physical harm, emotional stress or anxiety, financial harm, or threats to employment prospects (Riedel et al., 2022; Paris et al., 2022; Behera & Bala, 2023). In this study, potential harm was perceived in the form of emotional stress or anxiety and threats to current or future employment prospects. To protect respondents' interests, strict confidentiality was ensured, and respondents were assured that the study's results would not be linked to individual respondents. Additionally, respondents were informed that their provided information would be used solely for academic purposes and would not be disclosed to anyone else without their prior consent.

3.11.1 To safeguard against deception and related misrepresentation

Deception in research involves presenting the study as more than what it is (Moller, 2022; Jentjens & Cherbib, 2023). However, in this study, no deception was employed, as the research purpose was fully disclosed. To prevent deception and related misrepresentation, the researcher obtained a clearance letter from the Chinhoyi University of Technology's Institute of Lifelong Learning and Development Studies, aproval from five vocational centres (Ruwa, Chitungiza, Mt Hampde, Masvingo Urban and Mushagashe) and aproval letter from Ministry of Youth Empowerment, Development and Vocational Training prior to data collection. Additionally, an audience was sought with the Department of Vocational Training officials to clarify the study's purpose and obtain clearance to proceed. Furthermore, each questionnaire was accompanied by a cover letter that explained the study's purpose to each respondent.

3.11.2 Informed Consent

Ralph (2023) said that participants have the right to be informed about their role in the study and their rights during and after the study must be explained upfront. In this study, the researcher ensured that respondents were aware of their role and rights through a cover letter. Consent was obtained from respondents before administering the questionnaire, which included a compulsory 'yes/no' question to ensure privacy protection. In addition, there is a separate informed consent

form for consent to participate in the study not as part of the questionnaire. The researcher also ensured that only relevant information was collected, within the scope of the research and engagement.

3.11.3 Respect of Anonymity and Confidentiality

Confidentiality is a crucial ethical consideration in research, and the privacy and identity of participants should be protected (Muzari et al., 2022; Griffiths et al., 2023). In this study the researcher dealt with respondents in a manner that would protect their privacy and identity. No information regarding names or other personal identification was obtained from the respondents or their business. The respondents were assured that their identity would remain anonymous during and after the research has been completed. Additionally, the researcher did not seek information beyond the terms of engagement.

3.11.4 Respect of Privacy

Guidelines were followed in protecting sensitive information such as respondents' records. In conducting this research, human rights like right to privacy and autonomy and rules that apply at the workplace were followed.

3.11.5 Beneficence

The results from this study did not harm anyone and they benefited the researcher and other researchers in the field of vocational training. The researcher analysed and reviewed her work to avoid careless mistakes including information that could harm respondents and other researchers in coming up with results that were credible. The results from this research were shared through publishing the findings. The articles published were: Educational Technology in Vocational Training Programmes in Zimbabwe by Kuvezanekuumba 2 (1 & 2) ZEGU Press journal (Dhokura, 2023) and Determinants for the Adoption of Educational Technology in Zimbabwean Vocational training centres Vol 3 Issues 1& 2, 2024 ZEGU Journal of Law, Economics and Public Policy (Dhokura, Tsvere & Munikwa, 2024), which helped others who wanted to do research in adoption of educational technology in vocational training centres and the researcher was open to criticism and was receptive of new ideas.

3.11.6 Anti-plagiarism

There was acknowledgement of other peoples' work which was used in this research. The researcher reported her research honestly without prejudice in the following aspects: originality, investigations, explanations and assessments of other researchers. This is the first time the researcher has done this study. The information that was gathered was correct at the time of the research and this research is new. In doing this research, the researcher followed all the laws and regulations that govern research and conformed to them.

3.12 Chapter Summary

This chapter discussed the research methodology and included the discussion of the research philosophy, and the research design adopted for this study. The target population, sampling techniques which were used to arrive at the sample used in this study were outlined. Sources of data and data collection instruments including the justification for choosing the latter were also discussed. Furthermore, the validity and reliability aspects of the research instrument were shown. Moreover, chapter spelt out how the gathered data would be processed, presented and analysed. Lastly, the ethical considerations to this study were given. Going forward, the succeeding chapter will deal with the presentation and analysis of the study results.

CHAPTER FOUR

DATA PRESENTATION, INTERPRETATION AND ANALYSIS

4.0 Introduction

The previous chapter dealt with research methodology, and this current chapter covers the presentation, analysis, and interpretation of the study results following the research objectives. It offers conclusions drawn from the research project, highlighting the findings' significance and implications.

4.1 Questionnaires, Interviews and Observation Response Rate

400 questionnaires were distributed to the research respondents and 350 were completed and returned, whereas 50 were not returned. Ten (10) out of ten (10) scheduled interviews with the key informants were conducted. Overall, the study achieved an aggregated response rate of 86%. Table 4.1 below shows the response rate.

Table 0.1: Response Rate **N=400**

Research Instrument	**Respondents**	**Target Sample**	**Responses**	**Percentage (%)**
Questionnaires	Graduates	390	340	87
Interviews/ Observations	Principals	5	5	100
	Lecturers/ Staff	5	5	100
Aggregate Total		**400**	**350**	**100**

Source: Primary Data (2024)

A response rate of 87% indicates good reliability and validity of research findings as averred by Saunders et al., (2016) who state that a response rate above 50% is sufficient for generalisation of the study results.

Fowler et al., (2020) emphasises the importance of considering non-response rates in survey research. He notes that non-response can lead to biased results if the non-respondents differ significantly from the respondents. To minimise non-response bias, researchers should aim for a

high response rate, such as 80% or higher. If the response rate is low, additional questionnaires should be distributed to replace non-respondents.

John et al., (2020) also discuss the impact of non-response rates on survey research. They observe that non-response rates can vary significantly depending on the population, data collection method, and survey instrument. To ensure a representative sample, researchers should calculate the response rate and adjust the sample size accordingly. Additionally, distributing additional questionnaires to non-respondents can increase the response rate and improve the accuracy of the results.

Blinger et al., (2020) highlight the potential for non-response rates to lead to sampling bias. If the non-respondents are not representative of the population, the results may be skewed. To adjust for non-response, researchers can use weighting techniques or distribute additional questionnaires to non-respondents. Thompson also emphasises the importance of increasing the sample size to account for non-response, ensuring that the final sample is representative of the population. Therefore, to rectify this issue a total of 400 questionnaires were distributed in advance to the research respondents and 350 were completed and returned, whereas 50 were not returned.

In this study 87% response rate was achieved which is a significant strength of this study. This high response rate suggests that the participants and respondents were engaged and motivated to share their thoughts and experiences. It also provides a high level of representativeness, increasing the validity and reliability of the findings. With a complete set of responses, we can confidently analyse and interpret the data, knowing that we have a comprehensive understanding of the participants/respondents' perspectives.

4.2 Demographic Analysis

This section presents the demographic details including age, gender, educational qualification and work experience.

4.2.1 Biographic information for research participants

The study sought the personal details of the participants to assess whether their personal characteristics influenced the framework for adopting educational technology in vocational training centres.

Table 4.2 presents the profiles of principals/deputy principals/lecturers/staff from vocational training centres (CP, SP, RP, CL and RL0). Codes were used in place of the actual names of participants to ensure anonymity and confidentiality, as suggested by (Patel & Verma, 2022).

Table 0.2: Principals/deputy principals/Lecturers/Staff profiles

Participants (10) were selected through judgemental sampling	**Code**	**Age**	**Sex**	**Marital status**	**Education**
Categories of Principals, Lectures and staff	CP	48	F	Married	Masters in Entrepreneurship
	CDP	42	M	Married	Master's in Marketing
	SP	35	F	Single	Master's in Human Resources
	SDP	52	M	Married	Bachelors of Lifelong Learning Honours degree
	MNP	59	M	Married	Master's in international relations
	MNDP	43	F	Single	Bachelors of Public Relations
	RL	45	M	Single	Master in Statistics and Operational Research
	RDP	33	F	Married	Masters in international relations
	MHL	38	F	Single	Master's in counselling
	MHDP	32	M	Single	Masters in criminology
Gender	n=4) males 40%		n=6) females 60%		10 participants

Source: Primary Data (2024)

All participants interviewed were literate with a generally high level of education ranging from ordinary level to degree level as this marked the prerequisite for entrance into the vocational training centres as principals/ deputy principals/lecturers/staff. The age range of participants

oscillated between 35 to 59 years, an indication that vocational training centres were dominated by the younger age group who had the passion to work hard and perform beyond expectation.

Further, the results in the above table indicate that there were only vocational training centres principals/deputy principals/lecturers/staff which constituted the bulk of the sample of the whole population. The insights from these respondents provide valuable perspectives on the effectiveness of vocational training programmes and the challenges faced by students and instructors alike. As leaders of vocational training centres, these respondents offer unique insights into the strengths and weaknesses of current training programmes and identify areas for improvement. The respondents' experiences and expertise shed light on the critical role of vocational training in workforce development and the need for ongoing support and resources. This study's findings, drawn from the perspectives of respondents, highlight the importance of vocational training in addressing the skills gap and promoting economic growth. This was in line with observations by Lee (2021) who noted that experience has an impact on the workers' performance.

4.2.2 Section B: Distribution of graduates' respondents according to age, qualification and experience at vocational training centres

Table 0.3: Graduates age distribution, qualification and experience at vocational training centres experience (N=340)

Age range (years), qualification and vocational training centres experience	Response	Percentage (%)
Below 30	188	55
31 – 40	112	33
41 – 50	33	10
Above 50	7	2
Below 'O' Level	230	68
'O' and 'A' Level	100	29
Diploma	5	I
Degree	3	1

Master's& above	2	1
Less than 6 months duration of the course	165	49
6months-1 years duration of the course	110	32
1 - 2 years duration of the course	50	15
More than 2 years	15	4
Gender	n=190) males 56%	n=150) females 44%
Total	340	**100**

Source: Primary Data (2024)

Table 4.3 above shows that of category below 18-30 years had a response rate of 55% (n=188); category 31-40 years had a response rate of 33% (n=112), category 41-50 years had 10% (n=33), and lastly category of above 50 years had 2% (n=7).

Age characteristics were very important in this research study as objective responses came from a balanced age group. The fact that this study was composed of various age groups produces a situation where each age group offered diverse capabilities and aptitudes concerning the educational technology adoption in vocational training centres. The category of below 30 years had the highest response rate because the sampled graduates were still young and eager to learn. However, their knowledge of educational technology adoption could not be underestimated.

4.2.3 Gender of Respondents

Table 4:3 shows that the male respondents had the most dominant response rate of 56% (n=190) whilst females constituted 44% (n=150) in five vocational training centres. The variation in gender balance was so insignificant and did not have any influence on the research results.

4.2.4 Respondents Level of Education distribution

Table 4.3 above shows most respondents (68%, n=230) had not completed their secondary education, indicating a low level of educational attainment. A significant proportion (29%, n=100) had only completed Ordinary Level or below, suggesting a need for further education and training. A low proportion (1%, n=5) had diplomas. Only a small percentage (1%, n=5) had

a degree, indicating a limited number of highly educated individuals. An even smaller percentage (%, n=2) had a master's degree or higher, indicating a scarcity of highly qualified professionals.

Most of the respondents were graduates; hence they were still learning towards acquiring the "O"/ 'A' level qualification whilst attending vocational training courses. The remaining respondents had diplomas, degrees and master's degrees and this indicated that the research data was gathered from a knowledgeable group. This implies that most of the respondents understood the subject under study and they gave informed and honest responses.

4.2.5 Distribution of Respondents by Vocational Training Experience

The researcher also gathered data concerning respondents' experience or length of stay at vocational training centres either as graduates, teachers or staff members. Table 4.3 depicts the results.

Table 4.3 above shows most respondents (49%, n=165) had spent less than 1 year at vocational training centres, indicating a short duration of training. Most respondents had brief exposure to vocational training.

More comprehensive and extended training programmes may be needed to equip respondents with adequate skills. The limited duration of training could impact its effectiveness and the respondents' ability to apply their skills in real-world settings.

The length of their stay at vocational training centres was significant because respondents' experiences enabled them to give realistic information regarding the topic under study. Most of the participants who had less than a year at vocational training centres could be first-year/short-course graduates from the vocational training centres. In the same vein, the rest of the respondents had the experience of more than two years, and these could possess vast knowledge and experiences about learning activities being conducted at vocational training centres.

4.3 Findings and Analysis of Research Objectives

In this section, major findings given by respondents through questionnaires, participants through interviews and observation are presented and interpreted in line with the research objectives. Quantitative data was presented using descriptive statistics whereas qualitative data was analysed

using narrative analysis. The 10 key informants (principals/deputy principals/lecturers/staff) who were interviewed in this study were coded as **CP, CDP, RP, SP, MNP, CL, RL, SDP, MNDP** and **MHDP**.

4.3.1 Types of educational technology which are currently in use during Vocational Training programmes

Findings indicated in Table 4.5 below show types of educational technology which were then in use during Vocational Training programmes. The researcher used the Likert Scale parameters: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4= Agree, 5=Strongly Agree.

Table 0.4: Types of educational technology which are currently in use during Vocational Training programmes (N =340)

	Statements	*1(%)*	*2(%)*	*3(%)*	*4(%)*	*5(%)*	*Mean*	*Std. Deviation*
A1.	E-tools learning, also known as electronic learning or online learning, utilizes digital technologies and platforms to facilitate education, training, and skill development.	***9***	***22***	***2***	***20***	***47***	***4.54***	***0.667***
A2.	Online learning platforms in vocational training programmes offer equivalent or superior learning outcomes compared to traditional classroom-based instruction	***4***	***11***	***3***	***30***	***52***	***2.78***	***1.253***
A3.	Artificial intelligence-powered adaptive learning systems in vocational training programmes lead to personalized learning experiences.	***5***	***21***	***2***	***16***	***56***	***3.45***	***0.997***
A4.	Mobile learning adoption in vocational training centres faces barriers such as limited infrastructure and digital literacy but offers flexibility.	8	18	2	20	52	3.71	0.876
Mean Index							3.82	

Source: Primary Data (2024)

Table 4.5 depicts that 47% (i.e., most) of the respondents strongly agreed that e-tools learning, also known as electronic learning or online learning, utilises digital technologies and platforms to facilitate education, training, and skill development as represented by a mean of 4.54 and a standard deviation of 0.667 whereas 52% strongly agreed that online learning platforms in vocational training programmes offer equivalent or superior learning outcomes compared to traditional classroom-based instruction and mastery of the concepts taught to students as represented by a mean of 2.78 and standard deviation of 1.253. Likewise, 56% of the respondents strongly agreed that artificial intelligence-powered adaptive learning systems in vocational training programmes lead to personalised learning experiences as shown by a mean of 3.45 and a standard deviation of 0.997. A total of 52% of research participants strongly agreed that Mobile learning adoption in vocational training centres faces barriers such as limited infrastructure and digital literacy but offers flexibility as represented by a mean of 3.42 and a standard deviation of 0.746. Finally, the mean index stood at 3.82 depicting a moderate level of agreement.

The above results from questionnaires corroborate findings from the interviews and observations of principals and staff at vocational training centres which established that there were different types of educational technology adoption in vocational training centres.This is evidenced by the participants **RL, MNP**, **CP and SP** who said:

> *E-learning platforms like Learning Management Systems, online course platforms, and video conferencing tools are revolutionising the way we learn and teach. Interactive multimedia resources, virtual labs, and simulations provide immersive experiences that enhance understanding and retention*. **(CP).**
>
> *Virtual reality and augmented reality experiences can be used for trade skills training, industrial equipment operation, and commercial driver training.*
>
> *Digital portfolio and badge systems can be used to track and showcase students' skills and achievements. And finally, mobile apps and online resources can be used*

for just-in-time training, remote training, and accessing industry-specific tools and equipment manuals. **(RL).**

In vocational training centres, AI-powered adaptive learning systems can be used to create personalised learning paths for students in areas like IT, healthcare, and skilled trades.

By leveraging AI-powered adaptive learning systems, vocational training centres can provide more effective and efficient training experiences that meet the unique needs of each student." **(MNP).**

Mobile learning offers flexibility and accessibility, but its adoption in vocational training centres faces barriers such as limited infrastructure and digital literacy. However, many centres are finding creative ways to overcome these challenges.

For instance, a vocational training centre for electrical engineering might use mobile apps to deliver video tutorials and interactive simulations that students can access on the go. Another example is a culinary arts programme that uses mobile devices to access recipes, cooking techniques, and food safety guidelines in the kitchen. **(SP).**

Therefore different views of participants discussed how technology is transforming vocational training through e-learning platforms, interactive resources, and mobile apps. It highlighted the benefits of immersive experiences, digital portfolios, and personalised learning paths. Despite barriers like limited infrastructure, creative solutions are helping to increase accessibility and flexibility in vocational training.

4.3.2 Factors influencing technology adoption through adult learning in vocational training centres

Findings presented in Table 4.6 below show the factors influencing technology adoption in vocational training centres. The researcher used the Likert Scale parameters: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5=Strongly Agree.

Table 0.5: Factors influencing technology adoption through adult learning in vocational training centres. (N = 350)

	Statements	*1(%)*	*2(%)*	*3(%)*	*4(%)*	*5(%)*	*Mean*	*Std. Deviation*
B1.	Obstacles faced by graduates during the Covid 19 pandemic	***9***	***23***	***2***	***6***	***60***	***4.54***	***1.003***
B2.	Graduates' educational background, andgender affects adoption of new technologies.	***5***	***3***	***2***	***8***	***83***	***6,54***	***1.879***
B3.	Artificial intelligence and machine learning are revolutionising industries	***4***	***11***	***2***	***10***	***73***	***3.45***	1.236
B4.	The rise of the Internet of Things (loT) is transforming the way we live	5	5	2	28	50	7.41	2.109
Mean Index							**3.94**	

Source: Primary Data (2024)

Table 4.6 above indicates that; 60% strongly agreed that there were so many obstacles faced by educational technology users and determined mechanisms to enhance students' engagement while using e-learning systems during the COVID-19 pandemic as represented by a mean of 4.54 mean and a standard deviation of 1.003. A total of 83% of the respondents strongly agreed that students' educational background, gender and age are related to the adoption of new technologies as shown by a mean of 6.54 and a standard deviation of 1.879. A sum of 73% also strongly agreed that artificial intelligence and machine learning are revolutionising industries as indicated by a mean of 3.45 and a standard deviation of 1.236. Lastly, 50% of the respondents strongly agreed that the rise of the Internet of Things (loT) is transforming the way we live. The mean index stood at 3.94 indicating a moderate level of agreement.

The above results from questionnaires substantiated findings from the conducted interviews. In this vein, interviewees **RP, SP, RL, and MHDP.** and **CL** had this to say:

> *I think it's a critical issue that graduates' educational background and gender can impact their adoption of new technologies. Research has shown that students from STEM fields, for example, may have an easier time adapting to new technologies*

compared to those from non-STEM fields. Additionally, gender biases and stereotypes can also influence how comfortable students are with adopting new technologies.

In my opinion, this is a concern because technology is becoming increasingly integral to every industry and aspect of our lives. If certain groups of graduates are being left behind due to their educational background or gender, it could exacerbate existing inequalities and limit their career opportunities **. (RP).**

Graduates' educational background and gender should not dictate their ability to adopt new technologies. Every individual deserves equal access to technological advancements, regardless of their academic background or gender. We must address the existing disparities and create inclusive opportunities for all graduates to develop their skills and thrive in today's technology-driven world . **(MHDP).**

Research shows that our background and gender can play a significant role in how we adopt new technologies. For instance, people with a strong STEM background may be more likely to embrace new tech, while those from lower socioeconomic backgrounds may face barriers in accessing technology. Additionally, gender bias and socialisation can influence how men and women approach technology, with women potentially being less likely to adopt new tech. However, it's important to note that these are general trends and not everyone fits into these categories. We need to recognise and address these disparities to promote inclusivity in technology adoption. **(CL).**

*Artificial Intelligence (AI) and Machine Learning (ML) may automate some tasks, they also create new job opportunities in fields like AI development, deployment, and maintenance. Vocational training centres are adapting to these changes by offering training programmes in emerging technologies. This ensures that workers are equipped with the skills needed to thrive in an AI-driven economy***. (SP).**

The rise of the Internet of Things (IoT) is transforming the way we live, and vocational training centres are at the forefront of this revolution. By connecting

everyday objects to the internet, IoT is making them smarter and more interactive. In vocational training centres, IoT is being used to create smart workshops where tools and equipment are connected to the internet, allowing students to monitor and control them remotely. **(RDP).**

The participants discussed how graduates' educational background and gender can impact their adoption of new technologies, potentially exacerbating inequalities and limiting career opportunities. It highlighted the need to address these disparities and promote inclusivity in technology adoption, while also noting that vocational training centres are adapting to these changes by offering training programmes in emerging technologies like AI and loT.

4.3.3 Attitudes of adult learners towards modern educational technology

Findings in Table 4.7 below show the attitudes of adult learners towards modern technology. The researcher used the Likert Scale parameters whereby: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5=Strongly Agree.

Table 0.7: Responses on attitudes of adult learners towards modern educational technology (N = 350)

	Statements	***1(%)***	***2(%)***	***3(%)***	***4(%)***	***5(%)***	***Mean***	***Std. Deviation***
C1.	Positive attitudes to learning during the COVID-19 pandemic promoted e-learning	***13***	***8***	***5***	***15***	***60***	***5.69***	***1.948***
C2.	Graduates with experience benefited from e-learning	***11***	***14***	***07***	***20***	***50***	***2.78***	***1.061***
C3.	E-learning positively affected the relationship with graduates.	***8***	***11***	***2***	***20***	***59***	***2.88***	***1.022***
C4.	Some scholars believe that the graduates' attitude towards learning is swayed by the classroom environment.	7	25	4	50	15	6.57	2.357
Mean Index							**3.82**	

Source: Primary Data (2024)

Table 4.7 indicates that 60% of the participants strongly agreed that the positive attitudes and willingness of the most of the students to engage in distance learning classes in the post-COVID-

19 pandemic indicate that there is an immense potential future for e-learning platforms in vocational training centres as indicated by a mean of 5.69 and a standard deviation of 1.948 whilst a total of 50% respondents agreed that students with prior experience reported the deployed platform met their expectations in a similar way to the available solutions as represented by a mean of 2.78 and a standard deviation of 1.061. A sum of 59% of participants strongly agreed that e-learning in the school context positively affected their relationship with students and fostered classroom discourse as shown by a mean of 2.88 and a standard deviation of 1.022. Finally, a total of 50% of the participants agreed that some scholars believe that the student's attitude towards learning is swayed by the features of the classroom environment as shown by a mean of 6.57 and a standard deviation of 2.357. The mean index stood at 3.82 showing a low level of agreement.

These research results substantiate previous findings from interviews. This is evidenced by the participants **RL, SP, CP and MNP** who said:

> *The COVID-19 pandemic has undoubtedly disrupted traditional learning methods, but it has also accelerated the adoption of e-learning in vocational training centres. The positive attitudes of students and instructors towards e-learning have promoted its growth, enabling vocational training centres to continue providing quality education and training despite the challenges posed by the pandemic.*
>
> *For instance, vocational training centres have successfully implemented online platforms for courses such as automotive technology, culinary arts, and healthcare. These platforms have enabled students to access course materials, participate in virtual labs, and engage with instructors and peers remotely.* **(RL).**
>
> *E-learning has had a profoundly positive impact on the relationship between vocational training centres and graduates, fostering a sense of community, connection, and continuous learning. By leveraging digital platforms, vocational training centres have been able to maintain regular communication with graduates, providing ongoing support and guidance even after they have completed their programmes*. **(SP).**

Graduates with prior experience in their field have indeed benefited from e-learning during the COVID-19 pandemic, as it has enabled them to upskill and reskill conveniently and flexibly. Vocational training centres have played a crucial role in this regard, offering online courses and training programmes that cater to the needs of experienced graduates.

For example, a vocational training centre offering courses in cybersecurity has seen a significant increase in enrollment from graduates with prior experience in IT and computer science. These graduates have benefited from the online courses, which have enabled them to enhance their skills in areas such as cloud security, threat analysis, and incident response. **(CP).**

While e-learning has opened up new avenues for learning, some scholars argue that the classroom environment still plays a significant role in shaping graduates' attitudes towards learning. Vocational training centres have indeed observed that the physical and psychological aspects of the classroom environment can influence graduates.

Creating a culture of e-learning is key. When it becomes an integral part of our teaching and learning practices, graduates' performance will undoubtedly improve. We need to work on overcoming the barriers and misconceptions that prevent effective e-learning. **(MNP).**

The COVID-19 pandemic has accelerated the adoption of e-learning in vocational training centres, promoting growth and quality education despite challenges. E-learning has fostered a sense of community, enabled upskilling, and provided flexible learning opportunities. However, the classroom environment stll plays a significant role in shaping graduates' attitudes towards learning, and vocational training centres should work to create a culture of e-learning and overcome barriers to effective e-learning.

4.3.4 Competency of facilitators for modern educational technology adoption

Findings indicated in Table 4.8 below show competency of facilitators for modern educational technology adoption. The researcher used the Likert Scale parameters whereby: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5=Strongly Agree.

Table 0.8: Responses on Competency of facilitators for modern educational technology adoption (N = 350)

	Statements	***1(%)***	***2(%)***	***3(%)***	***4(%)***	***5(%)***	***Mean***	***Std. Deviation***
D1	Most facilitators possess current knowledge of educational technology platforms	***4***	***13***	***6***	***30***	***58***	***4.51***	***0.973***
D2.	Facilitators analyse and interprets data to inform educational ttechnology decisions	***6***	***17***	***4***	***33***	***40***	***3.81***	***0.992***
D3.	Facilitators ensure equity and accessibility in educational technology adoption	***6***	***12***		***53***	***27***	***2.98***	***1.075***
D4	Facilitators lead and to manage change in educational technology adoption	***3***	***7***	***3***	***52***	***35***	***3.45***	***1.252***
D5	Facilitators to manage educational technology projects effectively	84	2	7	2	5	3.82	0.937
Mean Index							**3.99**	

Source: Primary Data (2024)

Table 4.8 shows that the research respondents had established the competency of facilitators for modern educational technology adoption as depicted in Table 4.8: about 58% (majority) of the respondents strongly agreed that most facilitators possess current knowledge of educational technology platforms as indicated by a mean of 4.51 and a standard deviation (SD) of 0.973; and a total of 40% of respondents strongly agreed that facilitators analyse and interprets data to inform educational technology decisions as indicated by a mean of 3.81 and a standard deviation of 0.992. Furthermore, a sum of 53% respondents agreed that facilitators ensure equity and accessibility in educational technology adoption as shown by a mean of 2.98 and standard deviation of 1.075. Additionally, 52% of the respondents agreed that facilitators lead and manage change in educational technology adoption as represented by a mean of 3.45 and a standard

deviation of 1.252. Finally, a total of 34% of respondents disagreed that facilitators manage educational technology projects effectively as represented by a mean of 3.82 and a standard deviation of 0.937. The mean index stood at 3.99 showing a strong level of agreement.

The above results from questionnaires corroborate findings from the interviews and observations of principals and staff at vocational training centres which established the competency of facilitators for modern educational technology adoption. This is evidenced by the participants **RP, RL, CP, CL, SP, MNDP and MHDP** responses below:

> *At our vocational training centre, facilitators use online platforms like Canvas and Blackboard to deliver courses and engage with students. They regularly update their knowledge of these platforms to ensure they're using the latest features and tools to enhance teaching and learning.* **(MHDP).**

> *Our vocational training centre uses data analytics tools to track student engagement and progress. Facilitators analyse this data to identify areas where students need extra support and adjust their teaching strategies accordingly. For example, they might use data to determine which topics require more video tutorials or interactives*. **(RL).**

> *The study reveals that TVET teachers' ICT skills differ due to their demographic factors, and the TAM is a useful framework for understanding their willingness to adopt the technology. Moreover, teachers need time to prepare for e-learning before their first online teaching experience*. **(CL).**

> *The results indicate that vocational teachers possess basic ICT skills, but there are differences in their skill levels based on demographic factors.* **(RP***).*

> *We ensure that all students have access to the technology they need to succeed, regardless of their background or abilities. For example, our vocational training centre provides laptops and tablets for students who can't afford them, and our*

facilitators are trained to use accessibility features like closed captions and screen readers. **(CP).**

When our vocational training centre introduced virtual reality training simulations, facilitators played a key role in leading the transition. They received training on the new technology, developed implementation plans, and supported their colleagues in using the simulations effectively. **(SP).**

Our vocational training centre has implemented a project management tool to ensure that educational technology projects are completed on time and within budget. Facilitators use this tool to collaborate with colleagues, track progress, and identify potential roadblocks. For example, they might use it to manage the development of a new online course or the implementation of a new learning management system. **(MNDP).**

The participants highlighted that a vocational training centre is effectively utilising technology to enhance teaching and learning, including online platforms, data analysis, teacher training, accessibility features, virtual reality simulations, and project management tools. This commitment to technology integration supports facilitator development, student engagement, and equal access to education, ultimately driving student success.

4.3.5 Framework for Modern Educational Technology Adoption

Findings indicated in Table 4.9 below show factors for developing a framework for modern technology adoption. The researcher used the Likert Scale parameters whereby: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5=Strongly Agree.

Table 0.9: Responses on framework for modern educational technology adoption (N=350)

	Statements	***1(%)***	***2(%)***	***3(%)***	***4(%)***	***5(%)***	***Mean***	***Std. Deviation***
E1.	Technology should enhance and support personalised, inclusive, and engaging learning experiences for all students.	***5***	***14***	***4***	***28***	***60***	***4.35***	***0.973***

E2.	Centres should ensure reliable, secure, and user-friendly technology infrastructure	***3***	***11***	***2***	***21***	***63***	***3.74***	***0.796***
E3.	Develop a robust infrastructure to support technology adoption	***14***	***8***	***08***	***60***	***10***	***2.80***	***1.375***
E4	Facilitators lead and manage change in educational technology adoption, and promote digital technology into their teaching practices.	***3***	***7***	***3***	***62***	***25***	***3.55***	***1.352***
E5.	Effectiveness of educational tools assess the usability, accessibility, and user experience of the tools and platforms	8	5	10	7	70	3.72	0.828
Mean Index							**3.87**	

Source: Primary Data (2024)

Table 4.9 shows that the research respondents had established the factors for developing a framework for modern technology adoption as depicted in Table 4.9 about 60% (most) of the respondents strongly agreed that technology should enhance and support personalised, inclusive, and engaging learning experiences for all students. as indicated by a mean of 4.51 and a standard deviation (SD) of 0.973; and a total of 63% of respondents strongly agreed that centres should ensure reliable, secure, and user-friendly technology infrastructure as indicated by a mean of 3.81 and a standard deviation of 0.992. Furthermore, a sum of 60% of respondents agreed that vocational training centres should develop a robust infrastructure to support technology adoption as shown by a mean of 2.98 and standard deviation of 1.075. Additionally, 62% of the respondents agreed that facilitators lead and manage change in educational technology adoption as represented by a mean of 3.45 and a standard deviation of 1.252. Finally, a total of 34% respondents strongly agreed that effectiveness of educational tools assess the usability, accessibility, and user experience of the tools and platforms as represented by a mean of 3.82 and a standard deviation of 0.937. The mean index stood at 3.99 showing a strong level of agreement.

This is evidenced by the participants **CP, CDP, RP, SP, MNP, CL, RL, SDP, MNDP and MHDP** who said:

Educational framework improves student outcomes and academic achievement. **(MHDP).**

Empower graduates to take ownership of their learning by allowing them to choose the tools and platforms they use. **(RL).**

By giving graduates, the autonomy to select the tools and platforms they prefer, we empower them to take charge of their learning and develop a sense of agency and responsibility. **(CL)**.

When wallow graduates to choose the tools and platforms they want to use, we are enabling them to become active participants in their learning journey, fostering independence, and promoting a sense of ownership and engagement. **(CP).**

Develop a robust infrastructure to support technology adoption and develop a student-centred approach to technology integration. **(MNDP).**

To collaborate educational technology models, consider the following: Technological Pedagogical Content Knowledge framework, Substitution, Augmentation, Modification, Redefinition model and EdTech Integration Frameworks. For effectiveness of educational tools assess the usability, accessibility, and user experience of the tools and platforms. **(RP)**.

When it comes to collaborating educational technology models, we need to consider frameworks like Technological Pedagogical Content Knowledge, Substitution, Augmentation, Modification, Redefinition, and EdTech Integration Frameworks. Additionally, assessing the usability, accessibility, and user experience of educational tools and platforms is crucial for their effective integration in teaching and learning. (**SDP)**.

To effectively collaborate educational technology models, we must explore frameworks such as TPCK, SAMR, and EdTech Integration Frameworks. Moreover,

evaluating the usability, accessibility, and user experience of educational tools and platforms is vital to ensure seamless integration and maximum impact on student learning outcomes. **(MNP).**

To develop a thorough framework, we suggest a structure that encompasses the following components: a clear vision and mission, effective leadership and governance, robust infrastructure and support, ongoing professional development, seamless curriculum integration, rigorous assessment and evaluation, a student-centred approach, strong industry and community partnerships, sustainable funding, and a culture of continuous improvement. **(CDP).**

Our proposed framework consists of nine essential elements: a well-defined vision and mission, strong leadership and governance, adequate infrastructure and support, regular professional development, effective curriculum integration, comprehensive assessment and evaluation, a student-centred approach, collaborative industry and community partnerships, sustainable funding, and a commitment to continuous improvement. This structure ensures a comprehensive and sustainable approach to education. **(SP).**

The views expressed emphasise the importance of a student-centred approach to education, empowering graduates to take ownership of their learning, and leveraging technology to enhance teaching and learning. A comprehensive framework is proposed, comprising nine essential elements, to ensure a structured and sustainable approach to education that prioritises student needs, technology integration, and collaboration.

4.4 Hypothesis Testing

This section of the report provides information about testing of the research hypothesis. The researcher tested the hypothesis at 5% level of significance. The decision rule was to reject the null hypothesis (*H0*) if calculated p-value was less than 0.05, and to affirm the null hypothesis if the calculated p-value was greater than 0.05.

Hypothesis: Educational Technology Adoption and Graduates Performance in Vocational training centres

H0: Educational Technology Adoption has no positive significant influence on graduates' performance at Vocational training centres.

H1: Educational Technology Adoption has a positive significant influence on graduates' performance at vocational training centres

Table 0.10: Model Summary of Educational Technology Adoption

Model	R	R Square	Adjusted R Square
1	.782	.612	1.055

Findings in Table 4.10 indicate that the value of R-square is 0.612. This implies that 61.2% of the variation of graduates' performance was explained by educational technology adoption.

Table 0.10: ANOVA Table of Educational Technology Adoption

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	206.442	1	210.462	455.850	.004
1 Residual	51.216	299	2.112		
Total	258.098	300			

a. Dependent variable: Graduates Performance

b. Predictors: (Constant): Virtual Learning.

Findings in Table 4.10 indicate that at 0.05 level of significance the analysis variance (ANOVA) test proved that in this model the independent variable i.e. educational technology adoption is significant in predicting of graduates' performance as shown by a significant value of 0.004 which is less 0.05 level of significance ($p = 0.004 < 0.05$).

Table 0.6: Coefficients Model of Educational Technology Adoption

Model	Unstandardised Coefficients		Standardised Coefficients	T	Sig.
	B	**Std. Error**	**Beta**		
1 (Constant	**36.42**	**.464**		**4.246**	**.000**
Internet based learning	**.784**	**029**	**.92**	**36.324**	**0.000**

a. Dependent variable: Graduates' Performance

Findings in Table 4.11 indicate that educational technology adoption had a significant influence on graduates' performance at vocational training centres as represented by a t-statistic = 36.324 and p-value = 0.000 < 0.05.

The findings in Table 4.11 suggest that the adoption of Educational Technology (EdTech) has a significant and positive impact on students' performance, indicating that:

1. EdTech adoption leads to improved academic grades or marks.

2. EdTech enhances skill development and mastery.

3. EdTech improves knowledge retention and application

4. EdTech develops problem-solving and critical-thinking abilities

5. EdTech overall positively impacts academic progress and achievement

The t-statistic (36.324) and p-value (0.000 < 0.05) provide statistical evidence of this significant relationship, suggesting that EdTech adoption is a crucial factor in enhancing students' performance at vocational training centres. Therefore at a 5% level of significance, the null hypothesis (H0) was rejected and concluded that educational technology adoption had a positive significant influence on graduates' performance at vocational training centres. Thus, for each unit increase in educational technology adoption, there was a corresponding increase in graduates' performance by 0.784.

The null hypothesis (H0) was rejected, indicating that the relationship between educational technology adoption and graduates' performance is statistically significant and the study found a positive significant influence of educational technology adoption on graduates' performance, suggesting that increased adoption leads to improved performance. The study quantified the impact, stating that for each unit increase in educational technology adoption, graduates' performance increases by 0.784 and this had practical implications for vocational training centres, suggesting that investing in educational technology can lead to improved student outcomes. The 5% level of significance indicates that the results are reliable and unlikely to occur by chance (less than 5% probability). Finally, the study confirms the expected positive relationship between educational technology adoption and graduates' performance, supporting the idea that technology can enhance learning. Therefore, the findings can inform decision-making at vocational training centres, supporting the integration of educational technology to improve student performance.

4.5 Discussion of the objectives

In this Section, the discussion of objectives is based on the major findings given by respondents through questionnaires, participants through interviews and observation as presented**.**

4.5.1 Types of educational technology which are currently in use during vocational training programmes

The respondents overwhelmingly agree that e-tools learning, also known as online learning or electronic learning, has transformed the education landscape by leveraging digital technologies and platforms to facilitate education, training, and skill development. This includes the use of online courses and degree programmes delivered through Learning Management Systems like Canvas, Blackboard, or Moodle, as well as video conferencing tools like Zoom, Google Meet, or Skype for virtual lectures and collaborations. Interactive multimedia resources, such as videos, podcasts, and gamified content, are also used to engage learners and enhance understanding. Additionally, online simulations, virtual labs, and hands-on activities provide opportunities for learners to practice skills and apply theoretical knowledge. The use of Massive Open Online Courses (MOOCs), online communities, mobile apps, adaptive learning software, virtual reality (VR), and augmented reality (AR) experiences further enhance the learning experience. Overall, the respondents recognise the vast potential of e-tools learning to increase accessibility, provide

personalised learning experiences, and track progress through online assessments and feedback tools.

The main issue/theme emanating from these sentiments is the recognition of the significant positive impact of technology on education. All four participants highlight the increased access to information and resources, convenience, and flexibility that technology has brought to the learning and teaching process. They emphasise how technology has transformed the way we learn and teach, making it easier, more effective, and more engaging. The common thread running through their statements is the appreciation for the wealth of knowledge and resources that technology has made available, and the potential it must enhance the education experience.

The results are also in sync with the Constructivist Theory highlighted. According to this theory, educational technologies are used not just to control learning, but the main purpose is to make the learning process easier by creating an effective learning environment (Januszewski & Molenda, 2017).

These research results substantiate previous findings as indicated in this study. Thus, according to Haythornthwaite et al. (2017) as indicated by Montag et al., (2018) access to strong internet connectivity has been considered to be a key fundamental in the achievement of the vision of achieving widespread education. In another view, O'Leary and Giove (2018) buttress the issue of graduates' involvement in the fostering of student engagement is comprised of a wide range of factors which include amongst others, the perceptions of the graduates and their inclusion, consideration of the instructor aspect, and the provision of technology.

The resounding consensus among the respondents on the transformative impact of e-tools learning on education shows the importance of the e-tools. The widespread adoption of digital technologies and platforms has undoubtedly increased accessibility, convenience, and flexibility, making learning more engaging and effective. The findings align with the Constructivist Theory, which emphasises the role of technology in creating an effective learning environment. The discussion primarily focuses on the benefits of e-tools learning, with little critique or consideration of potential drawbacks, such as the digital divide, information overload, or the

need for human interaction. Future research should aim to provide a more nuanced understanding of the complex interplay between technology and learning, acknowledging both the opportunities and challenges that arise from the integration of e-tools in education. By doing vocational training centres can work towards creating a more comprehensive and inclusive learning environment that harnesses the potential of technology to support the diverse needs of all learners.

These research results substantiate previous findings as indicated in this study. Thus, according to Kundu and Bej (2021) India identified three types of educational technology adoption: basic, intermediate, and advanced users. Basic users utilise technology for simple tasks like browsing and word processing, while intermediate users leverage technology for online resources, multimedia, and discussions. Advanced users harness technology for specialised tasks like simulation, modelling, and virtual labs. These categories help understand the different levels of educational technology adoption and how teachers and educators can progress from basic to advanced users, enhancing their teaching and learning practices.

4.5.2 Factors influencing technology adoption through adult learning in vocational training centres

The analysis of the data reveals that educational technology users faced significant obstacles during the COVID-19 pandemic, but mechanisms were found to enhance student engagement with e-learning systems. Student demographics, such as educational background, gender, and age, play a crucial role in the adoption of new technologies. Additionally, artificial intelligence and machine learning are transforming industries, and the Internet of Things (IoT) is having a profound impact on our daily lives. Overall, the findings suggest that educational institutions and technology providers should consider student demographics when designing and implementing e-learning systems, and investments in AI, ML, and IoT technologies could lead to significant innovations and transformations in various industries.

The main issue that emerges from these sentiments is the lack of preparedness and support for effective technology adoption and utilisation in vocational training centres. The individuals highlighted various factors such as inadequate classroom space, lack of planning, inadequate

infrastructure, and facilitator incompetency as major hurdles. However, the common thread running through their statements is the emphasis on the crucial role of facilitators' proficiency in technology in determining the successful integration of technology in teaching and learning. The sentiments suggest that unless facilitators are adequately trained and comfortable using technology, it will be challenging to harness its potential in enhancing vocational training.

These research results substantiate previous findings as indicated in Chapter Two (2) of this study. Thus, Antonio et al., (2021) highlighted the importance of the following factors in making digital learning platforms successful user-centred design, high-quality content, personalisation and adaptability among others. By considering these factors, digital learning platforms can be designed to better support learning and user engagement.

4.5.3 Attitudes of adult learners towards modern educational technology

The data presented reveals a promising outlook for e-learning platforms in vocational training centres. A significant 60% of respondents strongly agreed that the positive attitudes of students towards distance learning indicate a bright future for e-learning platforms, suggesting that vocational training centres should invest in developing and improving their e-learning infrastructure. Additionally, 50% of the respondents agreed that students with prior experience found the deployed platform met their expectations, similar to existing solutions, indicating room for improvement. Notably, 59% of respondents strongly agreed that e-learning positively affected their relationship with students and fostered classroom discourse, highlighting its potential to enhance the learning environment. However, 51% of respondents strongly disagreed that stakeholders' perception was highly considered in the rebranding exercise, indicating a potential communication gap. Finally, 50% of respondents agreed that the classroom environment's features influence students' attitudes towards learning, emphasising the importance of creating a conducive learning environment. Overall, the data suggests that e-learning platforms have immense potential in vocational training centres, and investments should be made to improve infrastructure and address stakeholders' concerns to enhance the learning experience.

The main issue that emerges from these sentiments is the impact of e-learning on Vocational Training Centres during the COVID-19 pandemic. The COVID-19 pandemic has accelerated the adoption of e-learning in VTCs fostering a positive impact on the education and training landscape. E-learning has enabled vocational training centres to continue providing quality education and training despite the challenges posed by the pandemic, with students and instructors alike displaying positive attitudes towards remote learning. Moreover, e-learning has promoted a sense of community and connection among graduates, allowing vocational training centres to maintain regular communication and provide ongoing support and guidance. While e-learning has opened up new avenues for learning, the classroom environment still plays a significant role in shaping graduates' attitudes towards learning, highlighting the importance of considering physical and psychological aspects to promote motivation and engagement. Overall, e-learning has transformed vocational training centres, enabling them to adapt to the challenges posed by the pandemic and cater to the needs of diverse learners.

The current research findings align with and reinforce the previous studies discussed in Chapter Two (2), which Current et al., (2019) also highlighted that adults recognise the importance of self-directed learning for their professional development and see digital technology as essential for supporting their learning. However, they face challenges in using technology effectively and may need support in developing digital literacy and overcoming technical issues. Despite these challenges, adults are motivated to adopt technology for learning due to its convenience, flexibility, and accessibility. They prefer a range of learning formats, including online courses, webinars, and mobile apps, and emphasise the need for user-friendly and intuitive digital learning environments. To facilitate effective technology adoption, adults require support in developing self-directed learning skills and digital literacy, and expect institutions to provide adequate technical support and resources. By understanding adults' perspectives on adopting technology for self-directed learning, educators and institutions can better support their needs and create effective digital learning experiences.

4.5.4 Competency of facilitators for modern educational technology adoption

The research respondents have established the competency of facilitators in adopting modern educational technology in vocational training centres, with a strong level of agreement (mean

index of 3.99). The majority (58%) of respondents strongly agreed that facilitators possess current knowledge of educational technology platforms, and 40% strongly agreed that facilitators can analyse and interpret data to inform educational technology decisions. Additionally, 53% of the respondents agreed that facilitators ensure equity and accessibility in educational technology adoption, and 52% agreed that facilitators lead and manage change in educational technology adoption. However, 34% of respondents disagreed that facilitators manage educational technology projects effectively, indicating areas for improvement. Overall, the data highlights the importance of ongoing professional development and support for facilitators to enhance their technological expertise and ensure effective technology integration in vocational training.

The main issue that emerges from these sentiments is enhancing vocational training through technology strategies for effective integration and implementation. The participants' quotes highlight the various ways vocational training centres are leveraging technology to enhance teaching and learning. They discuss the use of online platforms, data analytics tools, and digital resources to support student engagement and progress. The quotes also touch on the importance of facilitators' ICT skills, the need for training and support, and the use of technology to promote accessibility and inclusivity. Additionally, they mention the implementation of new technologies like virtual reality training simulations and project management tools to improve efficiency and effectiveness. This theme captures the essence of the participants' quotes, showcasing the diverse ways technology is utilised in vocational training centres to improve teaching and learning outcomes. The theme highlights the importance of facilitators' roles in effectively integrating technology, the need for ongoing training and support, and the potential of technology to promote accessibility, inclusivity, and efficiency in vocational training.

The current research findings align with and reinforce the previous studies discussed in Chapter two based on the study on New challenges in higher education: A study of the digital competence of educators in Covid times" by Núñez-Canal et al. (2022). The study highlights the need for educators to develop their digital competence to effectively integrate educational technology into their teaching practices. The findings suggest that while educators have made efforts to adapt to the new digital landscape, there are still gaps in their competency levels, particularly in areas such as pedagogical use of technology, digital content creation, and online

assessment. To address these challenges, institutions must provide targeted training and support for educators to develop their digital skills and confidence. Additionally, educators must be willing to embrace lifelong learning and continuous professional development to stay abreast of the rapidly evolving educational technology landscape.

4.5.5 Framework for Modern Educational Technology Adoption

The research respondents have established several key factors for developing a framework for modern technology adoption in vocational training centres. Firstly, about 60% of respondents believe that technology should enhance personalised learning experiences for all students. Additionally, 63% of respondents agree that centres should ensure reliable, secure, and user-friendly technology infrastructure. Furthermore, 60% of respondents agree that vocational training centres should develop robust infrastructure to support technology adoption. Examples of vocational training centres in Zimbabwe that may benefit from these insights include the Chitungwiza, Ruwa, Mt Hampden, Mucheke Urban and Mushagashe Vocational Training Centres. By prioritising these factors, these centres can create an effective framework for modern technology adoption that improves learning outcomes and enhances the overall educational experience. For instance, the Zimbabwean Vocational Training Centres could focus on developing personalised learning experiences through technology, while the Ruwa Vocational Training Centre could invest in robust technology infrastructure. Mt Hampden Vocational Training Centre could focus on developing facilitators' skills to lead and manage change in educational technology adoption.

The main issue/theme emanating from these sentiments is a comprehensive framework for effective technology integration in education. The participants highlight the importance of a comprehensive framework for technology integration in education, emphasising the need for a student-centred approach, robust infrastructure, and continuous improvement. They propose a structure that includes vision and mission, leadership and governance, infrastructure and support, professional development, curriculum integration, assessment and evaluation, student-centred approach, industry and community partnerships, sustainability and funding, and continuous improvement. This framework aims to ensure effective technology integration, improve student

outcomes, and promote academic achievement. The participants stress the importance of considering frameworks like TPCK, SAMR, and EdTech Integration Frameworks, and assessing the usability, accessibility, and user experience of educational tools and platforms. By adopting this comprehensive framework, educational institutions can create a sustainable and effective approach to technology integration, ultimately enhancing student learning outcomes.

These research results substantiate previous findings as indicated in Chapter two of this study. Thus, Kurdi et al., (2020) emphasise the need for a comprehensive framework to facilitate educational technology adoption. The framework should address key factors such as technological infrastructure, teacher training, curriculum integration, student engagement, assessment and evaluation, institutional support, collaboration and partnership, continuous professional development, infrastructure maintenance, and monitoring and evaluation. By considering these factors, the framework can promote effective technology adoption, enhance teaching and learning outcomes, and ultimately improve the quality of education in Zimbabwean Vocational Training Centres. This framework can serve as a guiding tool for educators, administrators, and policymakers to ensure that technology is effectively integrated into the education system, leading to improved student outcomes and a more skilled workforce.

4.6 Chapter Summary

This chapter looked at data presentation, analysis and interpretation of research results. The chapter deliberated on respondents' response rate followed by demographic data and then analysis, presentation and discussion of research objectives. The research findings indicated that vocational training centres are not exceptional to the use of different types of educational technology during vocational training programmes, however there are factors which influence educational technology adoption in vocational training programmes and these hinder graduates' performance. Furthermore, the chapter presented the findings on attitudes of adult learners towards modern educational technology and the contribution of competency of facilitators towards modern educational technology. Finally, the research hypothesis was tested, and it was concluded that educational technology adoption activities had a positive significant influence on graduates' performance at vocational training centres. The next chapter provides the study summary, conclusions and recommendations.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The previous chapter provided an analysis, presentation and interpretation of the research results. This chapter presents the summary of the research, the conclusions drawn, and recommendations made. The study focused on enhancing technology adoption in Vocational Training Centres (VTCs) in Zimbabwe. Its primary objective was to investigate and identify strategies to improve the adoption and integration of technology in VTCs, with the ultimate goal of enhancing the quality and effectiveness of vocational training in Zimbabwe.

5.2 Summary of the Study

The purpose of this research study was to develop a framework towards enhancing technology adoption through adult learning in vocational training drawing reference from vocational training centres in Zimbabwe. The study adopted a mixed methds approach. A study on VTCs found that respondents emphasised the need for blended learning and virtual platforms, such as WhatsApp, Zoom, and Google Classroom, to improve student performance. The centres implemented both synchronous and asynchronous virtual learning, with a tendency towards asynchronous learning due to nationwide network issues. However, respondents noted that limited access to technology, insufficient training, and technophobia hindered adult learners' use of technology, highlighting the need for a supportive e-learning culture to improve student performance.

5.3 Practical Challenges

The researcher faced practical challenges on response rate (87%) on questionnaires that is the percentage of participants who completed and returned the questionnaire out of the total number of participants who were invited to respond. More so, the researcher had limited time constraints as she was a student, an employee and a family woman who had other social obligations to

attend to during the research period. Despite these challenges, the researcher never compromised the research findings of this study until its successful completion within the specified due dates.

5.4 Approval of the Research Hypothesis

The research hypothesis was tested and it proved that educational technology adoption had a positive significant influence on graduates' performance at vocational training centres in Zimbabwe.

5.5 Conclusions

Types of educational technologies which were in use during vocational training programmes had a great value on graduates' performance in Vocational Training Centres. This includes the use of online courses and degree programmes delivered through Learning Management Systems like Canvas, Blackboard, or Moodle, as well as video conferencing tools like Zoom, Google Meet, or Skype for virtual lectures and collaborations. Interactive multimedia resources, such as videos, podcasts, and gamified content, are also used to engage learners and enhance understanding. Additionally, online virtual labs, and hands-on activities provide opportunities for learners to practice skills and apply theoretical knowledge. The use of Massive Open Online Courses (MOOCs), online communities, mobile apps, adaptive learning software, virtual reality (VR), and augmented reality (AR) experiences further enhance the learning experience.

Nonetheless, it was established that factors influencing technology adoption through adult learning which hindered graduates' performance, and if not checked could affect graduates' performance. Student demographics, such as educational background, gender, and age, play a crucial role in the adoption of new technologies. Additionally, artificial intelligence and machine learning are transforming industries, and the Internet of Things (IoT) is having a profound impact on our daily lives. As such, promoting a culture of e-learning to both graduates and teachers could enhance graduates' performance. Within this context, most teachers possessed basic ICT Skills, which assisted them in adopting educational technology easily.

Implementation of frameworks in educational technology integration ensured a purposeful, pedagogically sound, and learning-goal-aligned approach to harnessing technology for effective student learning. Finally, the hypothesis was tested, and it was proved that educational

technology adoption had a positive significant influence on graduates' performance in vocational training centres.

5.6 Implications of the study

1. Adoption of modern educational technology can significantly enhance the quality of vocational training, making it more engaging, accessible, and effective. Interactive simulations, virtual reality experiences, and multimedia content can increase student engagement, while online and distance learning options can expand access to vocational training. Personalised learning, real-time feedback, and data analytics can improve instruction and student outcomes. Additionally, technology can facilitate collaboration, industry connections, and continuous updates, ensuring that vocational training is relevant and effective in preparing learners for successful careers.
2. Platforms and asynchronous learning can expand access to education, especially for adult learners with busy schedules or who are limited by geographical locations.
3. Developing facilitators' competency in educational technology can effectively improve their ability to effectively integrate technology in vocational education.
4. The study's findings can inform policy decisions on investing in educational technology infrastructure and promoting the adoption of modern educational technology in Vocational Training Centres.
5. The study's results can guide future research on the impact of educational technology on student performance, facilitator competency development, and the effectiveness of frameworks for educational technology integration.
6. Adoption of educational technology can lead to improved student performance, as it provides access to a wider range of learning resources and flexible learning arrangements. It is also hoped that the study would shed light to the stakeholders of the Vocational Training Centres in Zimbabwe on the importance of providing the centres with education technology tools and equipment.
7. Upon completion, this study fulfils the requirements for the award of a Doctorate degree in Lifelong Learning and Development Studies to the researcher.

8. This research would contribute to the achievement of Vision 2030 in Zimbabwe, which is driven by innovation and the application of new technologies.
9. The institution of Chinhoyi University of Technology would gain knowledge on enhancing educational technology adoption through adult learning in VTCs. The university would also assess the student's research to comprehend and implement the principles from the module of information and communication technology (ICT).

5.7 Recommendations

Recommendations for this study were derived from the findings of the research:

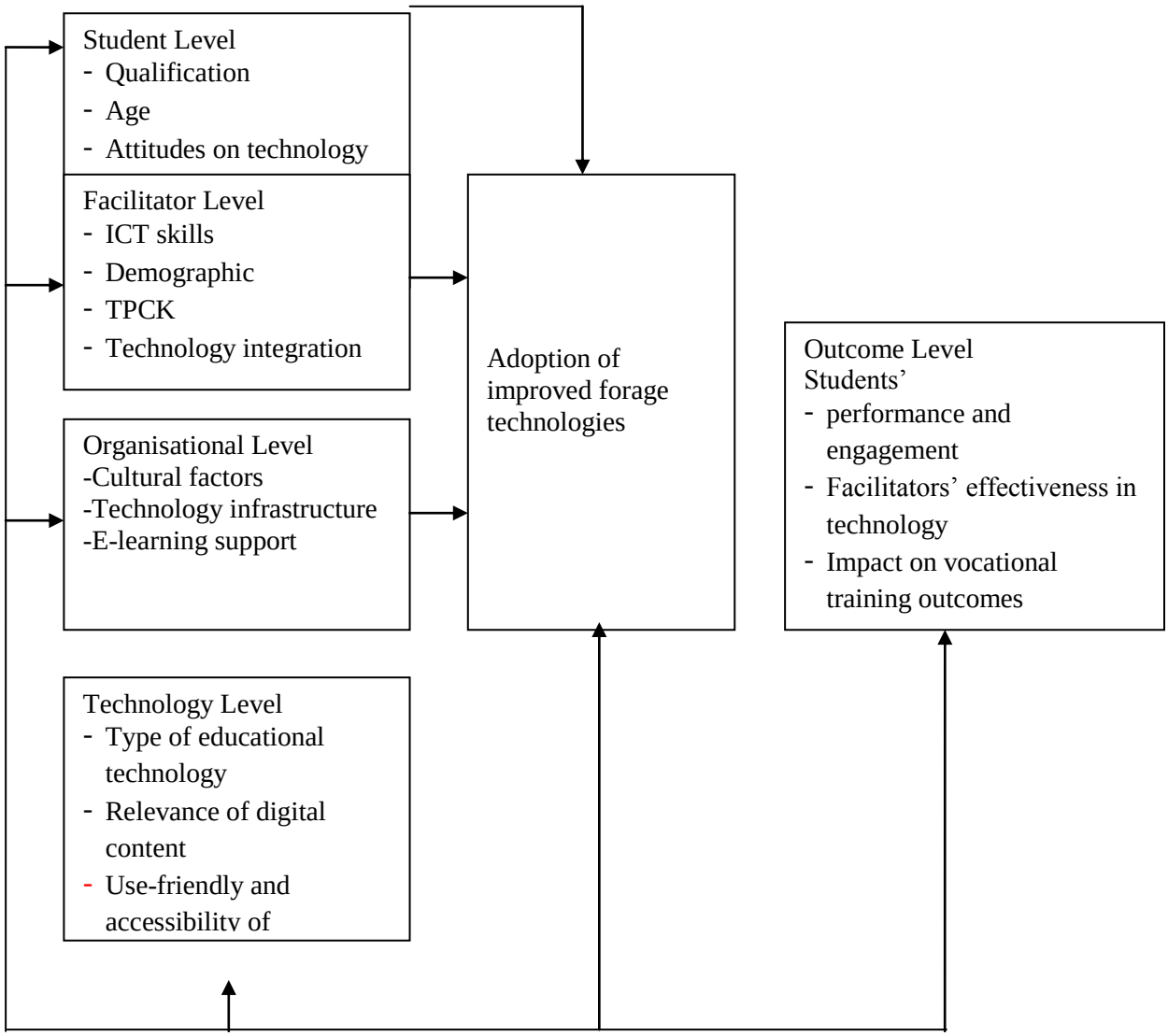


Figure 5.1: Student, Facilitator, Organisation, Technology and Outcome (SFOTO) Model 2024: Framework for educational technology integration in Vocational training centres

The SFOTO Model (2024) provides a framework for educational technology integration in Vocational Training Centres, considering five key factors:

S - Student (learner characteristics, needs, and engagement)

F - Facilitator (teacher/trainer roles, skills, and support)

O - Organisation (institutional policies, resources, and culture)

T - Technology (hardware, software, and digital resources)

O - Outcome (learning objectives, assessment, and evaluation)

5.8.1 How the proposed framework works

1. Student: Identify learner characteristics, needs, and engagement levels to determine the appropriate technology and instructional strategies.
2. Facilitator: Ensure teachers/trainers have the necessary skills and support to effectively integrate technology and facilitate student learning.
3. Organisation: Align institutional policies, resources, and culture to support educational technology integration and vocational training goals.
4. Technology: Select and implement appropriate hardware, software, and digital resources to enhance teaching and learning.
5. Outcome: Establish clear learning objectives, assessment, and evaluation strategies to measure student learning outcomes and programme effectiveness.

   Vocational Training Centres to provide training and support for teachers to effectively integrate technology into their teaching practices.

After identifying the key factors using the SFOTO Model, the next step is to adopt improved forage technologies to enhance training in Vocational Training Centres. By adopting improved forage technologies in VTCs, students can gain practical experience with industry-relevant tools and techniques, making them more employable and better prepared to contribute to the agricultural sector.

5.8.2 **Possible outcome level for each of the factors**

5.8.2.1 Students' level

The adoption of improved forage technologies in Vocational Training Centres can lead to improved academic achievement in agricultural education, enhanced practical skills in forage production and management, and increased accuracy and efficiency in using technology for agricultural tasks. Additionally, students' engagement is also likely to increase, with higher motivation and interest in learning, increased participation and engagement in class activities, and improved student attendance and retention rates.

5.8.2.2 Facilitators' effectiveness in technology

The use of improved forage technologies (tools, and systems which aim to improve efficiency, and productivity) can also enhance facilitators' effectiveness in teaching and learning. Facilitators can improve their confidence and competence in using technology, integrate technology more effectively into their teaching practices, and support student learning more efficiently.

5.8.2.3 Impact on Vocational Training Outcomes

The adoption of improved forage technologies can ultimately lead to improved vocational training outcomes in agriculture. Graduates can become more employable and job-ready, and vocational training programmes can become more relevant and effective. The use of improved forage technologies can also enhance the alignment of vocational training programmes with industry needs and standards, leading to better outcomes for students and the broader agricultural industry.

5.9 Areas for Further Study

The researcher recommends that further study be done on the challenges faced by adult learners through educational technology adopted in vocational training centres in Zimbabwe.

5.10 Contribution of the Study

A framework was developed: Student Facilitator, Organisation, Technology and Outcome (SFOTO) Model 2024: Framework for educational technology integration in vocational training centres.

5.9.1 There are two published papers published titled:

1. Dhokura, E (2023) Educational Technology in Vocational Training Programmes in Zimbabwe, *Journal of Vocational Education and Training*, *75*(1), 1-8. doi:.10.1080/13636820.2022.2152134

2. Dhokura, E., Tsvere, M., & Munikwa, S. (2024). Determinants for the Adoption of Educational Technology in Zimbabwean Vocational Training Centres. *Lighthouse: The Zimbabwe Ezekiel Guti University Journal of Law, Economics and Public Policy*, 3(1 & amp; 2), 111-135.

In ZEGU Press

Teacher Competencies And Vocational Training Information In Zimbabwe: A Correlational Analysis.

The researcher conducted a Female PhD Exchange workshop hosted by Alimah International between 22 March- 04 May 2024 and she presented the abstract of this study and can find the profiles on the website under participants on https://www.alimahinternational.org/exchangeshistory

REFERENCES

Abbas, N., Zhang, Y., Taherkordi, A., & Skeie, T. (2017). Mobile edge computing: A survey. IEEE *Internet of Things Journal*, 5(1), 450-465.

Abbasi, K. R., Hussain, K., Radulescu, M., & Ozturk, I. (2021). Does natural resources depletion and economic growth achieve the carbon neutrality target of the UK? A way forward towards sustainable development. *Resources Policy*, 74, 102341.

Abubakari, M. S., & Zakaria, G. A. N. (2023). Technology acceptance model in Islamic education (TAMISE) for digital learning: conceptual framework proposal. *Canadian Journal of Educational and Social Studies*, 3(4), 25-42.

Abdul-Rahman Al-Malah, D. K., Majeed, B. H., & Salim ALRikabi, H. T. (2023). "Enhancement of Educational Technology by using 5G networks". *International Journal of Emerging Technologies in Learning*, 18(1), 1-15.

Abenawe, C. (2022). Social Economic Status in Selected Secondary Schools in Ibanda District Uganda. IAA *Journal of Education*, 8(1), 73-89.

Aboudahr, S., & Saidin, K. (2023). The Moderating Role of Training in the Relationship between Leadership Implementation of Quality Management and Lecturers' Performance: A Case Study in Egypt Higher Education Institutions. *Journal of Pedagogy and Education Science*, *2*(01), 48-63.

Glazebrook, P. (Ed.). (2015). *Blackstone's Statutes on Criminal Law* 2015-2016. Oxford University Press, USA.

Agboola, M. G., Awobajo, K. A., Oluwatobi, S. O., Akinbode, M. O., Fagbohun, M. O., Esse, U. C., ... & Betek, C. M. (2019, September). Effect of digitalization on the performance of commercial banks in Nigeria. *In IOP conference series: Earth and environmental science* (Vol. 331, No. 1, p. 012014). IOP Publishing.

Aguilera-Hermida, A. P. (2020). College students' use and acceptance of emergency online learning due to COVID-19. *International journal of educational research open*, 1, 100011.

African Economic Outlook 2020" and was published on January 30, 2020

Aithal, P. S., & Aithal, S. (2020). Analysis of the Indian National Education Policy 2020 towards achieving its objectives. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, *5*(2), 19-41.

Akoka, J., Comyn-Wattiau, I., Prat, N., & Storey, V. C. (2023). Knowledge contributions in design science research: paths of knowledge types. *Decision support systems*, *166*, 113898.

Akram, H., Yingxiu, Y., Al-Adwan, A. S., & Alkhalifah, A. (2021). Technology integration in higher education during COVID-19: An assessment of online teaching competencies through technological pedagogical content knowledge model. *Frontiers in psychology*, 12, 736522.

Al-Ababneh, M. M. (2020). Linking ontology, epistemology and research methodology. *Science & Philosophy*, *8*(1), 75-91.

Albrecht, D., & Haupt, M. (2022). The impact of training on learners' confidence and proficiency in using digital tools. *Journal of Educational Computing Research, 60(*4), 858-883.

Alagarsamy, S., Mehrolia, S., &Solaikutty, V. M. (2021). Customers response to online food delivery services during COVID- 19 outbreak using binary logistic regression. *International journal of consumer studies*, 45(3), 396-408.

Alam, M. A. (2023). Open innovation ecosystems: a mixed methods study on the strategic management of inter-organisational openness (Doctoral thesis, Macquarie University).

Al- Amer, R., Maneze, D., Everett, B., Montayre, J., Villarosa, A. R., Dwekat, E., & Salamonson, Y. (2022). *COVID- 19* vaccination intention in the first year of the pandemic: A systematic review. *Journal of clinical nursing*, 31(1-2), 62-86.

Al-Gahtani, A. S. (2016). The impact of computer-assisted learning on students' achievement in mathematics. *Journal of Educational Computing Research,* 54(4), 419-433. doi: 10.1177/0735633116646114

Alhaimer, R. (2023). Exploring the Attitudes of Kuwait's Residents toward the Role of Corruption and Anti-Corruption Entities (Nazaha) in Kuwait. *Public Integrity,* 25(3), 305-321.

Alheet, A. F., & Hamdan, Y. (2021). Exploring the relationship between emotional intelligence and job performance: A study of Jordanian retail industry. *International Journal of Entrepreneurship*, 25(3), 1-16.

Albrecht, D. (2022). Asynchronous learning: A guide for educators. *Routledge.* doi: 10.4324/9781003163214.

Alhaimer, R. (2024). Exploring the Attitudes of Kuwait's Residents Toward the Role of Corruption and Anti-Corruption Entities (Nazaha) in Kuwait. *Public Integrity,* 26(3), 305-321.

Akther, J. (2020). Influence of UNESCO in the Development of Lifelong Learning. *Open Journal of Social Sciences*, 8(03), 103.

Al-Kurdi, O. F., El-Haddadeh, R., & Eldabi, T. (2020). The role of organisational climate in managing knowledge sharing among academics in higher education. *International Journal of Information Management,* 50, 217-227.

Al-Malah, A.-R., Majeed, B. H., &ALRikabi, H. T. (2023). Enhancement of Educational Technology by using 5G networks. *International Journal of Emerging Technologies in Learning*, 18(1), 1-15. doi: 10.3991/ijet.v18i1.xxxx

Al-Okaily, M., Alkhwaldi, A. F., Abdulmuhsin, A. A., Alqudah, H., & Al-Okaily, A. (2023). Cloud-based accounting information systems usage and its impact on Jordanian SMEs' performance: The post-COVID-19 perspective. *Journal of Financial Reporting and Accounting*, 21(1), 126-155.

Alrasheedi, M., Capretz, L. F., & Raza, A. (2016). Management's perspective on critical success factors affecting mobile learning in higher education institutions—An empirical study. *Journal of Educational Computing Research*, 54(2), 253-274.

Alsharari, N. M., & Al-Shboul, M. (2019). Evaluating qualitative research in management accounting using the criteria of "convincingness". *Pacific Accounting Review*, 31(1), 43-62.

Alshammari, A. (2019). The impact of e-readiness on elearning success in Saudi Arabian Higher Education Institutions.

Alshurideh, M., Kurdi, B., Alzoubi, H., Obeidat, B., Hamadneh, S., & Ahmad, A. (2022). The influence of supply chain partners' integrations on organisational performance: The moderating role of trust. *Uncertain Supply Chain Management*, 10(4), 1191-1202.

Alvarez, R. M., Atkeson, L. R., Levin, I., & Li, Y. (2019). Paying attention to inattentive survey respondents. *Political Analysis*, 27(2), 145-162.

Armstrong, J., Garstang, J., Debelle, G., Anand, I., Botcher, E., Chaplin, H., ... & Taylor, J. (2020). Effect of COVID-19 lockdown on child protection medical assessments: a retrospective observational study in Birmingham, *UK*. *BMJ open*, 10(9), e042867.

Amadi, A. (2023). Integration in a mixed-method case study of construction phenomena: From data to theory. Engineering, *Construction and Architectural Management*, 30(1), 210-237.

Amer, S. A., Shah, J., Abd-Ellatif, E. E., & El Maghawry, H. A. (2022). *COVID-19* vaccine uptake among physicians during the second wave of COVID-19 pandemic: attitude, intentions, and determinants: a cross-sectional study. *Frontiers in Public Health*, 10, 823217.

Antoniadis, J., Arzoumanian, Z., Babak, S., Bailes, M., Bak Nielsen, A. S., Baker, P. T.,& Zhu, X. J. (2022). The International Pulsar Timing Array second data release: Search for an isotropic gravitational wave background. Monthly Notices of the Royal Astronomical Society, 510 (4), 4873-4887.

Antonio-Villa, Neftali Eduardo, Omar Yaxmehen Bello-Chavolla, Arsenio Vargas-Vázquez, Carlos A. Fermín-Martínez, Alejandro Márquez-Salinas, Julio Pisanty-Alatorre, and Jessica Paola Bahena-López (2021):. "Assessing the burden of coronavirus disease 2019 (COVID-19) among healthcare workers in Mexico City: a data-driven call to action." Clinical Infectious Diseases 73, no. 1 e191-e198.

Asad, A., Basheer, M. F., Irfan, M., Jiang, J., & Naveed, R. T. (2020). Open-Innovation and knowledge management in Small and Medium-Sized Enterprises (SMEs): The role of external knowledge and internal innovation. Revista Argentina de ClínicaPsicológica.

Ashwin, P., & Case, J. M. (2018). Higher education pathways*: South African undegraduate education and the public good* (p. 308). African Minds.

Asvio, N. (2017). The influence of learning motivation and learning environment on undergraduate studentsâ€™ learning achievement of management of Islamic education, study program of IAIN Batusangkar In 2016. Noble International Journal of Social Sciences Research, 2(2), 16-31.

Austin, S., Mekis, R., Mohammed, S. E., Scalise, M., Wang, W. A., Galluccio, M., ... & Nowikovsky, K. (2022). TMBIM5 is the Ca2+/H+ antiporter of mammalian mitochondria. EMBO reports, 23(12), e54978.

Badriparsad, N.& Gumede, L., (2022). Online teaching and learning through the students' eyes– Uncertainty through the COVID-19 lockdown: A qualitative case study in Gauteng province, South Africa. *Radiography*, 28 (1), 193-198.

Bali, S., & Liu, Y. (2018*)*. Exploring the role of social media in education: A systematic review. *Journal of Educational Technology Development and Exchange*, 11 (1), 1-28. doi: 10.18785/jetde.1101.04

Bandura, A. (2019). Applying theory for human betterment. *Perspectives on Psychological Science*, 14(1), 12-15.

Baltes, S., & Ralph, P. (2022). Sampling in software engineering research*: A critical review and guidelines.* Empirical Software Engineering, 27(4), 94.

Bariu, T. N. (2020). Status of ICT infrastructure used in teaching and learning in secondary schools in Meru County, *Kenya. European Journal of Interactive Multimedia and Education*, 1(1), e02002.

Barker, T. H., Stone, J. C., Sears, K., Klugar, M., Leonardi-Bee, J., Tufanaru, C.,& Munn, Z. (2023). Revising the JBI quantitative critical appraisal tools to improve their applicability: an overview of methods and the development process. *JBI Evidence Synthesis*, 21(3), 478-493.

Barman, N. (2022). Digital technology adoption and its impact on the education system during the COVID-19 pandemic. *International Management Review*, 18 (27), 6.

Barrett, B. (1998). What is the function of a university? Ivory tower or trade school for plumbers?.*Quality Assurance in Education*, 6(3), 145-151.

Bastos, M. L., Tavaziva, G., Abidi, S. K., Campbell, J. R., Haraoui, L. P., Johnston, J. C., ... & Khan, F. A. (2020*).* Diagnostic accuracy of serological tests for covid-19: systematic review and meta-analysis. *British Medical Journal*, 370.m2427. doi: 10.1136/bmj.m2427

Bat-Erdene, E., Tumurbaatar, E., Tumur-Ochir, G., Jamiyandorj, O., Jadamba, T., Yamamoto, E., ... & Lkhagvasuren, B. (2023). Validation of the abbreviated version of the World Health Organisation Quality of Life in Mongolia: a population-based cross-sectional study among adults in Ulaanbaatar. *Nagoya Journal of Medical Science*, 85(1), 79.

Becuwe, H., Roblin, N. P., Tondeur, J., Thys, J., Castelein, E., & Voogt, J. (2017). Conditions for the successful implementation of teacher educator design teams for ICT integration: A Delphi study. *Australasian Journal of Educational Technology*, 33(2),1-18.

Behera, R. K., & Bala, P. K. (2023). Unethical use of information access and analytics in B2B service organisations: The dark side of behavioural loyalty. *Industrial Marketing Management*, 109, 14-31.

Behnsen, P., van Lier, P., Levavi, K., Marieke Buil, J., Huizink, A., Koot, S., &Atzaba- Poria, N. (2022). The potential moderating role of living in a conflict area on the link between classroom psychosocial stressors, perceived stress and change in anxiety symptoms in Israeli school children. *JCPP advances*, 2(4), e12092.

Behravan, A., Lowry, M., Ashraf-Khorasani, M., Tran, T. Q., Feng, X., & Brand, A. S. (2023). Effect of pretreatment on reclaimed asphalt pavement aggregates for minimizing the impact of leachate on cement hydration. *Cement and Concrete Research*, 173, 107305.

Bell, E., Bryman, A., & Harley, B. (2022). *Business research methods.* Oxford university press.

Berakon, I., Wibowo, M. G., Nurdany, A., & Aji, H. M. (2023*).* An expansion of the technology acceptance model applied to the halal tourism sector. *Journal of Islamic Marketing*, 14(1), 289-316*.*

Bergen, N., &Labonté, R. (2020). "Everything is perfect, and we have no problems": detecting and limiting social desirability bias in qualitative research. *Qualitative health research*, 30(5), 783-792.

Billett, S. (2020). Vocational education and training: A review of the literature. *Journal of Vocational Education and Training*, 72(1), 1-25. doi: 10.1080/13636820.2020.1711151

Biney, I. K. (2018). Improving Teaching and Learning in Higher Education Institutions: Is Discussion Method Theanswer?. *MIER Journal of Educational Studies Trends and Practices,*8(2), 147-163.

Biswas, A., Bhattacharjee, U., Chakrabarti, A. K., Tewari, D. N., Banu, H., & Dutta, S. (2020). *Emergence of Novel Coronavirus and COVID-19: whether to stay or die out?. Critical reviews in microbiology*, 46(2), 182-193.

Bizami, N. A., Tasir, Z., & Kew, S. N. (2023). Innovative pedagogical principles and technological tools capabilities for immersive blended learning: a systematic literature review. *Education and Information Technologies*, 28(2), 1373-1425.

Berndt, A. E. (2020). Sampling methods. *Journal of Human Lactation*, 36(2), 224-226.

Beyer, L. E. (1979). Aesthetic theory and the ideology of educational institutions. *Curriculum Inquiry*, 9(1), 13-26.

Bizami, N. A., Tasir, Z., & Kew, S. N. (2023). Innovative pedagogical principles and technological tools capabilities for immersive blended learning: a systematic literature review. *Education and Information Technologies*, 28(2), 1373-1425.

Bloomfield, J., & Fisher, M. J. (2019). Quantitative research design. *Journal of the Australasian Rehabilitation Nurses Association*, 22(2), 27-30.

Bo, N. S. W. (2024). *OECD* digital education outlook 2023: Towards an effective education ecosystem. *Hungarian Educational Research Journal*.

Boelens, R., & De Wever, B. (2022). Synchronous and asynchronous online learning: A systematic review of the literature. *Computers & Education*, 177, 103351.

Bolinger, M. T., Josefy, M. A., Stevenson, R., & Hitt, M. A. (2022). Experiments in strategy research: A critical review and future research opportunities. *Journal of Management*, 48(1), 77-113.

Bond, M. (2020). Facilitating student engagement through the flipped learning approach in K-12: A systematic review. *Computers & Education*, 151, 103819.

Bordas, A., Soriano-Arandes, A., Subirana, M., Malagrida, R., Reyes-Urueña, J. M., Folch, C., ... & Casabona, J. (2022). Study protocol for monitoring SARS-CoV-2 infection and its determinants in Catalonia (Spain): an observational and participatory research approach in a Sentinel Network of Schools. *BMJ open*, 12(1), e055649.

Borenstein, M. (2022). Comprehensive meta- analysis software. *Systematic reviews in health research: meta- analysis in context*, 535-548.Wiley.

Bos, J. (2020). *Research ethics for graduates in the social sciences (p. 287). Springer Nature*.doi: 10.1007/978-3-030-37326-2.

Bougie, R., & Sekaran, U. (2019). Research methods for business: *A skill-building approach (7th ed.).* John Wiley & Sons.

Bozalek, V. (2017). Participatory parity and emerging technologies. *Socially just pedagogies, capabilities and quality in higher education: Global perspectives*, 89-107.

Bracey, G. E. (2021). Beyond Movements: The Ontology of Black Lives Matter. *Mobilization: An International Quarterly*, 26(4), 489-496.

Braun, V., & Clarke, V. (2021). To saturate or not to saturate? Questioning data saturation as a useful concept for thematic analysis and sample-size rationales. *Qualitative research in sport, exercise and health*, 13(2), 201-216.

Braun, V., & Clarke, V. (2022). Conceptual and design thinking for thematic analysis. *Qualitative Psychology*, 9(1), 3.

Brown, J. R., Eichhorst, B., Hillmen, P., Jurczak, W., Kaźmierczak, M., Lamanna, N., ... & Shadman, M. (2023). Zanubrutinib or ibrutinib in relapsed or refractory chronic lymphocytic leukemia. *New England Journal of Medicine*, 388(4), 319-332.

Brown, C., & Raaper, R (2020*).* The Covid-19 pandemic and the dissolution of the university campus: Implications for student support practice. *Journal of professional capital and community*, 5(3/4), 343-349.

Buabeng-Andoh, F., &Attor, C. (2023). The Application of Artificial Intelligence in Financial Reporting: A Vosviewer&Rstudio Analysis. In Conference Proceedings Dokbat 2023 19th International Bata Conference for Ph. D. *Students and Young Researchers* (p. 58).

Buckingham, S. A., Anil, K., Demain, S., Gunn, H., Jones, R. B., Kent, B., ... & Freeman, J. (2022). Telerehabilitation for people with physical disabilities and movement impairment: a survey of United Kingdom practitioners. *JMIRx Med*, 3(1), e30516.

Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., ... & Willumsen, J. F. (2020). World Health Organisation 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine*, 54(24), 1451-1462.

Byun, S., & Slavin, R. E. (2020). *Educational responses to the COVID-19 outbreak in South Korea. Best Evid Chin Edu*, 5(2), 665-680.

Cappa, F., Franco, S., & Rosso, F. (2022). Citizens and cities: Leveraging citizen science and big data for sustainable urban development. *Business Strategy and the Environment*, 31(2), 648-667.

Chalupa, S., & Petricek, M. (2024). Understanding customer's online booking intentions using hotel big data analysis. *Journal of vacation marketing*, 30(1), 110-122.

Chmelka, A., Anderson, L., Ferraresi, E., Griffith, M., Klima, N., Marsh, C., ... & Sutela, E. (2020). Communities and Students Together (CaST): A State-Of-The-Art Review of Engaged Learning in Belgium, Finland, Germany, Italy, Spain and the United Kingdom.

Chai, C. S., Koh, J. H. L., & Lim, C. P. (2020). Exploring the relationship between teachers' technological pedagogical content knowledge (TPACK) and their technology integration practices. *Journal of Educational Technology Development and Exchange,* 13(1), 1-22.

Charles, M. A., Thierry, X., Lanoe, J. L., Bois, C., Dufourg, M. N., Popa, R., ... & Geay, B. (2020). Cohort profile: the French national cohort of children (ELFE): birth to 5 years. *International journal of epidemiology,* 49(2), 368-369.

Chen, Y., Ji, S., Chen, C., Peng, Q., Wang, D., & Li, Y. (2018). *Single-atom catalysts: synthetic strategies and electrochemical applications. Joule,* 2(7), 1242-1264.

Chestnut, S. A. (2020). A closer look at art abroad: a study of the Terra Foundation for American Art's educational programmememing for international audiences (Doctoral thesis).

Cheteni, P., & Umejesi, I. (2023). Application of indigenous knowledge and sustainable agriculture by small-scale farmer households and entrepreneurs in South Africa. *International Journal of Development and Sustainability,* 12(1), 1-18.

Chiu, C. Y., Chen, S., & Chen, C. L. (2017). An integrated perspective of TOE framework and innovation diffusion in broadband mobile applications adoption by enterprises.

International Journal of Management, Economics and Social Sciences (IJMESS), 6(1), 14-39.

Chmelík, V., Rychtáriková, M., Müllner, H., Jambrošić, K., Zelem, L., Benklewski, J., & Glorieux, C. (2020). Methodology for development of airborne sound insulation descriptor valid for light-weight and masonry walls. *Applied Acoustics,* 160, 107144.

Chmielewski, M., & Kucker, S. C. (2020). An MTurk crisis? Shifts in data quality and the impact on study results. *Social Psychological and Personality Science,* 11(4), 464-473.

Chun Tie, Y., Birks, M., & Francis, K. (2019). Grounded theory research: A design framework for novice researchers. *SAGE open medicine,* 7, 2050312118822927.

Cichosz, M., Wallenburg, C. M., &Knemeyer, A. M. (2020). Digital transformation at logistics service providers: barriers, success factors and leading practices. *The International Journal of Logistics Management,* 31(2), 209-238.

Clark, R. C., & Mayer, R. E. (2016). E-Learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning (pp. 1-416). *Wiley*. *ISBN* 978-1-118-92336-4.

Claudia, M., & Wijaya, A. (2023). The Effects of Frugal Innovation, Strength-Based Approach, and Social Media on the Longevity of Small Businesses in Jakarta in 2021. *International Journal of Application on Economics and Business*, 1(1), 18-26.

Collins Dictionary. (2023). Collins English dictionary (13th ed.). HarperCollins Publishers. ISBN 978-0-00-838383-4.

Coelhoso, P., & Kalogeras, S. (2024). Faculty Perspectives on Web Learning Apps and Mobile Devices on Student Engagement. *Journal of Information Technology Education: Innovations in Practice,* 23, 3.

Couch, D. L., O'Sullivan, B., & Malatzky, C. (2021). *What COVID‐19 could mean for the future of "work from home": The provocations of three women in the academy. Gender, Work & Organisation,* 28, 266-275.

Cox, A. (2023). How artificial intelligence might change academic library work: Applying the competencies literature and the theory of the professions. *Journal of the Association for Information Science and Technology,* 74(3), 367-380.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches.* Sage publications.

Curren, E., Yoshida, T., Kuwahara, V. S., & Leong, S. C. Y. (2019*). Rapid profiling of tropical marine cyanobacterial communities. Regional Studies in Marine Science,* 25, 100485.

Dahalan, F., Alias, N., & Shaharom, M. S. N. *(2024).* Gamification and game based learning for vocational education and training: A systematic literature review. *Education and Information Technologies,* 29(2), 1279-1317.

da Silva, P. R., Porto, P., Rocha, M. C., Tamaki, E. R., Corrêa, M. G., Fernandez, M., ... & Pimenta, D. N. (2023). Women and working in healthcare during the Covid-19 pandemic in Brazil: bullying of colleagues. *Globalization and health,* 19(1), 1-14.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly,* 13(3), 319-340.

Davies, D. R., Ghelichkhan, S., Hoggard, M. J., Valentine, A. P., & Richards, F. D. (2023). *Observations and models of dynamic topography: Current status and future directions. Dynamics of plate tectonics and mantle convection,* 223-269.

Deci, E. L, Ryan, R. M., &. (2019). Brick by brick: The origins, development, and future of self-determination theory. *In Advances in motivation science* (Vol. 6, pp. 111-156). Elsevier.

Dahalan, F., Alias, N., &Shaharom, M. S. N. (2024). Gamification and game based learning for vocational education and training: *A systematic literature review. Education and Information Technologies,* 29(2), 1279-1317.

Dany, C. (2024). Humanitarian Interventions: Ethical Dilemmas for Humanitarian NGOs. *In The Palgrave Handbook of International Political Theory:* Volume II (pp. 269-288). Cham: Springer Nature Switzerland.

Degtiar, I., & Rose, S. (2023). A review of generalizability and transportability. *Annual Review of Statistics and Its Application,* 10, 501-524.

Dey, P., Fletcher, D., &Verduijn, K. (2023). Critical research and entrepreneurship: A cross- disciplinary conceptual typology. International Journal of Management Reviews, 25(1), 24-51.

Dhar, U. (2021). Asian Development Bank (ADB), Asian Development Outlook 2020: What Drives Innovation in Asia?

Domínguez-Andrés Netea, M. G., , J., Barreiro, L. B., Chavakis, T., Divangahi, M., Fuchs, E., ... & Latz, E. (2020). Defining trained immunity and its role in health and disease. *Nature Reviews Immunology,* 20(6), 375-388.

Donegan, A., Devine, D., Martinez- Sainz, G., Symonds, J., & Sloan, S. (2023). Children as co- researchers in pandemic times: Power and participation in the use of digital dialogues with children during the Covid- 19 lockdown. *Children & Society,* 37(1), 235-253.

Douaud, G., Lee, S., Alfaro-Almagro, F., Arthofer, C., Wang, C., McCarthy, P., ... & Smith, S. M. (2022). SARS-CoV-2 is associated with changes in brain structure in UK *Biobank. Nature,* 604(7907), 697-707.

Dowling, M., & Lucey, B. (2023). ChatGPT for (finance) research: The Bananarama conjecture. *Finance Research Letters,* 53, 103662.

Durik, A. M., Lindeman, M. H., & Coley, S. L. (2017). The power within: How individual interest promotes domain-relevant task engagement. *The science of interest,* 125-148.

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., ... & Wright, R. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, 71, 102642.

Dzinoreva, T., Mavunga, G., & Govender, L. (2023). Towards a context-relevant, institution-based ICT integration model of teacher education curriculum at diploma level in Zimbabwe. *African Journal of Teacher Education,* 12(2), 162-188.

Elvin, S., &Mutangabende, S. (2016). Assessing progress and pitfalls of the millennium development goals in Zimbabwe: a critical analysis. *Africa's Public Service Delivery and Performance Review*, 4(4), 573-605.

Eom, S. B., Wen, H. J., & Ashill, N. (2006). The determinants of graduates' perceived learning outcomes and satisfaction in university online education: An empirical investigation. *Decision Sciences Journal of Innovative Education,* 4(2), 215-235.

Emiliani, F. E. (2023). Encoding Permanent Records of Transcription in the Genome (Doctoral thesis, Dartmouth College).

Etemadifar, M., Nouri, H., Maracy, M. R., Sigari, A. A., Salari, M., Blanco, Y., ... & Sedaghat, N. (2022). Risk factors of severe COVID-19 in people with multiple sclerosis: A systematic review and meta-analysis. *Revue neurologique,* 178(1-2), 121-128.

Falloon, G. (2024). An exploration of online technoliteracy capability teaching and learning in early years classrooms. *Education and Information Technologies,* 29(1), 625-654.

Fatimah, F. S., Asy'ari, H., Sandria, A., &Nasucha, J. A. (2023). Learning Fiqh Based on the TAPPS (Think Aloud Pair Problem Solving) Method in Improving Student Learning Outcomes. At-Tadzkir: *Islamic Education Journal*, 2(1), 1-15.

Faustmann, G., Kirchner, K., Lemke, C., & Monett, D. (2019). Which factors make digital learning platforms successful? *In INTED2019 proceedings* (pp. 6777-6786). IATED.

Fernando, Y., Wahyuni-TD, I. S., Gui, A., Ikhsan, R. B., Mergeresa, F., & Ganesan, Y. (2022). A mixed-method study on the barriers of industry 4.0 adoption in the Indonesian SMEs manufacturing supply chains. *Journal of Science and Technology Policy Management.*

Ferrario, B., &Stantcheva, S. (2022,). Eliciting people's first-order concerns: text analysis of open-ended survey questions. *In AEA Papers and Proceedings* (Vol. 112, pp. 163-169).

Ferreira, A., Silva, G. M., & Dias, Á. L. (2023). Determinants of continuance intention to use mobile self-scanning applications in retail. *International Journal of Quality & Reliability Management*, 40(2), 455-477.

Ferri, F., Grifoni, P., & Guzzo, T. (2020). Online learning and emergency remote teaching: Opportunities and challenges in emergency situations. *Societies*, 10(4), 86.

Foster, A. M., & Talley, A. E. (2023). Antecedent goals for concealable stigma disclosure: The ironic effects of compassion. *Journal of Social Issues*.

Fowler Jr, F. J., Brenner, P. S., Cosenza, C., & Cleary, P. D. (2022). How responding in Spanish affects CAHPS results. *BMC Health Services Research*, 22(1), 884.

Fraser, H., Bush, M., Wintle, B. C., Mody, F., Smith, E. T., Hanea, A. M.,& Fidler, F. (2023). Predicting reliability through structured expert elicitation with the repliCATS (Collaborative Assessments for Trustworthy Science) process. *Plos one*, 18(1), e0274429.

Freeman, J. P. (2005). Postsecondary education for the underserved in America: A study of highly non-traditional graduates in community colleges. *North Carolina State University*.

Fox, C. W., Meyer, J., & Aimé, E. (2023). Double- blind peer review affects reviewer ratings and editor decisions at an ecology journal. *Functional Ecology*, 37(5), 1144-1157.

Fussell, S. G., & Truong, D. (2022). Using virtual reality for dynamic learning: an extended technology acceptance model. *Virtual Reality*, 26(1), 249-267.

Gay, G. (2018). Culturally responsive teaching: Theory, research, and practice. teachers college press.

Cascaldi-Garcia, D., Sarisoy, C., Londono, J. M., Sun, B., Datta, D. D., Ferreira, T., ... & Rogers, J. (2023). What is certain about uncertainty?. *Journal of Economic Literature*, 61(2), 624-654.

He, C., Pan, Y., Ouyang, Y., Shen, Q., Gao, Y., Yan, K., ... & Chen, H. (2022). Manipulating the D: A interfacial energetics and intermolecular packing for 19.2% efficiency organic photovoltaics. *Energy & Environmental Science*, 15(6), 2537-2544.

Hesse-Biber, S. N. (2010). Mixed methods research: Merging theory with practice. *Guilford Press.* Volume 1. (pp. 1-352)

Haythornthwaite, C., Kumar, P., Gruzd, A., Gilbert, S., Esteve del Valle, M., & Paulin, D. (2018). Learning in the wild: coding for learning and practice on Reddit. *Learning, media and technology*, 43(3), 219-235.

Hidi, S. E., & Renninger, K. A. (2019). Interest development and its relation to curiosity: Needed neuroscientific research. *Educational Psychology Review*, 31(4), 833-852.

Hofer, S. I., Heine, J. H., Besharati, S., Yip, J. C., Reinhold, F., &Brummelman, E. (2024). Self-perceptions as mechanisms of achievement inequality: evidence across 70 countries. npj Science of Learning, 9(1), 2.

Geels, F. W. (2022). Causality and explanation in socio-technical transitions research: Mobilising epistemological insights from the wider social sciences. *Research policy*, 51(6), 104537.

Ghazinoory, S., & Aghaei, P. (2023). Metaphor research as a research strategy in social sciences and humanities. *Quality & Quantity*, 1-22.

Gioia, D., Corley, K., Eisenhardt, K., Feldman, M., Langley, A., Lê, J., ... & Welch, C. (2022). A curated debate: On using "templates" *in qualitative research. Journal of Management Inquiry*, 31(3), 231-252.

Give F, Bednařík, P., Tkáč, I.,Eberly, L. E., Deelchand, D. K., Barreto, F. R., & Mangia, S. (2018). Neurochemical responses to chromatic and achromatic stimuli in the human visual cortex. *Journal of Cerebral Blood Flow & Metabolism*, 38(2), 347-359.

Giri, G., & Manohar, H. L. (2023). Factors influencing the acceptance of private and public blockchain-based collaboration among supply chain practitioners: a parallel mediation model. *Supply Chain Management: An International Journal*, 28(1), 1-24.

Gissy, H., & Ahmadini, A. A. H. (2024). Solutions for the System of Nonlinear Mixed Variational Inequality Problems.

Bollmann, A. T. (2021). Danish Defense Transformation and the Technopolitics of Relevant Military Contributions. *Scandinavian Journal of Military Studies,* 4(1), 62-77.

Gonzalez, R., Sørum, H., & Raaen, K. (2022). Emergency digital teaching during the COVID-19 lockdown: Graduates' perspectives. *Education Sciences*, 12(3), 152.

Goundar, M. S., & Kumar, B. A. (2022). The use of mobile learning applications in higher education institutes. *Education and Information Technologies*, 1-24.

Gray, G., Sadoff, J., Gray, G., Vandebosch, A., Cárdenas, V., Shukarev, G., Grinsztejn, B., ... &Douoguih, M. (2022). Final analysis of efficacy and safety of single-dose Ad26. COV2. S. *New England Journal of Medicine,* 386(9), 847-860.

Griffiths, L., Calabria, V., & Bailey, M. (2023). 10 Valuing Research in Health and Social Care. Key Themes in Health and Social Care: A Companion to Learning.

Grifoni, P., & Guzzo, TFerri, F.. (2020). Online learning and emergency remote teaching: Opportunities and challenges in emergency situations. Societies, 10(4), 86.Gumede, L., &Badriparsad, N. (2022). Online teaching and learning through the graduates' eyes–Uncertainty through the COVID-19 lockdown: A qualitative case study in Gauteng province, South Africa. *Radiography*, 28(1), 193-198.

Gnambs, T., & Lenhard, W. (2024). Remote testing of reading comprehension in 8-year-old children: Mode and setting effects. *Assessment,* 31(2), 248-262.

Guner, H., &Acarturk, C. (2020). The use and acceptance of ICT by senior citizens: a comparison of technology acceptance model (TAM) for elderly and young adults. *Universal Access in the Information Society*, 19, 311-330.

Guzzo, R. A., Schneider, B., & Nalbantian, H. R. (2022). Open science, closed doors: The perils and potential of open science for research in practice. *Industrial and Organisational Psychology*, 15(4), 495-515.

Hacker, J. S., & Pierson, P. (2019). Policy feedback in an age of polarization. *The ANNALS of the American Academy of Political and Social Science*, 685(1), 8-28.

Henderson, M., Horton, D. B., Bhise, V., Pal, G., Bushnell, G., & Dave, C. V. (2023). Initiation patterns of disease-modifying therapies for multiple sclerosis among US adults and children, 2001 through 2020. *JAMA neurology*, 80(8), 860-867.

Hannon, M. (2023). The Politics of Post-Truth. *Critical Review*, 35(1-2), 40-62.

Hassan, Y. A. (2022). Leadership Styles And Organisational Change In Horumuud In Mogadishu, Somalia. GSJ, 10(6).

Hair, J., & Alamer, A. (2022). Partial Least Squares Structural Equation Modelling (PLS-SEM) in second language and education research: Guidelines using an applied example. *Research Methods in Applied Linguistics*, 1(3), 100027.

Hardaker, C. (2010). Trolling in asynchronous computer-mediated communication: *From user discussions to academic definitions*

Harriss, D. J., MacSween, A., & Atkinson, G. (2019). Ethical standards in sport and exercise science research: 2020 update. *International journal of sports medicine*, 40(13), 813-817.

Hasniati, H., Indriasari, D. P., Sirajuddin, A., & Karim, A. (2023). The Decision of Women in Makassar City to Be Entrepreneurs. *Binus Business Review*, 14(1), 85-98.

Hesse-Biber, S. N. (2022). Mixed methods research: Merging theory with practice. *Guilford Press.* (pp. Volume 1, 1-352)

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational technology research and development*, 55, 223-225

Hewitt, P. (2023). The Hewitt Review. An independent review of Integrated Care Systems. *Department of Health and Social Care*: GOV. UK.

Hill, H. C., Ball, D. L., & Schilling, S. G. (2008). Unpacking pedagogical content knowledge: Conceptualizing and measuring teachers' topic-specific knowledge of graduates. *Journal for research in mathematics education*, 39(4), 372-400.

Hillerbrand, R., &Werker, C. (2019). Values in university–industry collaborations: the case of academics working at Universities of Technology. *Science and Engineering Ethics*, 25, 1633-1656.

Hilton, L. K., Ngu, H. S., Collinge, B., Dreval, K., Ben-Neriah, S., Rushton, C. K., ... & Scott, D. W. (2023). Relapse timing is associated with distinct evolutionary dynamics in diffuse large B-cell lymphoma. *Journal of Clinical Oncology*, 41(25), 4164-4177.

Holte, M. B., Diaconu, A., Ingerslev, J., Thorn, J. J., & Pinholt, E. M. (2022). Virtual surgical analysis: Long-term cone beam computed tomography stability assessment of segmental bimaxillary surgery. *International Journal of Oral and Maxillofacial Surgery*, 51(9), 1188-1196.

HR, G., & Aithal, P. S. (2022). Deriving Right Sample Size and Choosing an Appropriate Sampling Technique to Select Samples from the Research Population During Ph. D. Programmeme in India. *International Journal of Applied Engineering and Management Letters* (IJAEML), 6(2), 288-306.

Hrastinski, S. (2019). What do we mean by blended learning? *TechTrends*, 63(5), 564-569.

Hsieh, Chiang, W. L., Liu, X., Si, S., Li, Y., Bengio, S., &, C. J. (2019,). Cluster-gcn: An efficient algorithm for training deep and large graph convolutional networks. *In Proceedings of the 25th ACM SIGKDD international conference on knowledge discovery & data mining* (pp. 257-266).

Huang, L., Lei, W., Xu, F., Liu, H., & Yu, L. (2020). Emotional responses and coping strategies in nurses and nursing graduates during Covid-19 outbreak: A comparative study. *PloS one*, 15(8), e0237303.

Huber, S. G., & Helm, C. (2020). COVID-19 and schooling: evaluation, assessment and accountability in times of crises—reacting quickly to explore key issues for policy, practice and research with the school barometer. *Educational Assessment, Evaluation and Accountability*, 32, 237-270

Hussar, W. J., & Bailey, T. M. (2014). Projections of Education Statistics to 2022. NCES 2014-051. *National Center for Education Statistics.*

Hyland, P. (2023). All we like sheep: The need for reflection and reflexivity in IO psychology. *Industrial and Organisational Psychology,* 16(1), 77-95.

Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., & Bond, M. A. (2020). The difference between

Hoffman, R. R., LaDue, D. S., Mogil, H. M., Roebber, P. J., & Trafton, J. G. (2023). Minding the weather: How expert forecasters think. *MIT Press.emergency remote teaching and online learning.*

Hoffman, R. R., LaDue, D. S., Mogil, H. M., Roebber, P. J., & Trafton, J. G. (2023). Minding the weather: How expert forecasters think. MIT Press.

Isensee, F., Jaeger, P. F., Kohl, S. A., Petersen, J., & Maier-Hein, K. H. (2021). NnU-Net: a self-configuring method for deep learning-based biomedical image segmentation. *Nature methods,* 18(2), 203-211.

Islam, M. A., &Aldaihani, F. M. F. (2022). Justification for adopting qualitative research method, research approaches, sampling strategy, sample size, interview method, saturation, and data analysis. *Journal of International Business and Management,* 5(1), 01-11.

Issa, A., Samaneh, H., & Ghanim, M. (2022). Predicting pavement condition index using artificial neural networks approach. *Ain Shams Engineering Journal*, 13(1), 101490.

Iyer, N., Khemani, R., Emeriaud, G., López-Fernández, Y. M., Korang, S. K., Steffen, K. M., ... &Bembea, M. M. (2023). Methodology of the Second Pediatric Acute Lung Injury

Consensus Conference. *Pediatric Critical Care Medicine, 24* (Supplement 1 2S), S76-S86.

James, S. L., Yorgason, J. B., Holmes, E. K., Johnson, D. R., & Busby, D. M. (2022). Is it still possible to collect nationally representative marriage data in the United States? A case study from the create project. *Family Relations*, 71(4), 1428-1443.

Jentjens, S., &Cherbib, J. (2023). Trust me if you can–Do trust propensities in granting working-from-home arrangements change during times of exogenous shocks*? Journal of Business Research*, 161, 113844.

Jiang, W., & Li, B. (2023). Empowerment in the crisis: Narratives of COVID-19 generation researchers. In Research and Teaching in a Pandemic World: *The Challenges of Establishing Academic Identities during Times of Crisis* (pp. 287-301). Singapore: Springer Nature Singapore.

Jerrim, J., Micklewright, J., Heine, J. H., Salzer, C., & McKeown, C. (2018). PISA 2015: how big is the 'mode effect'and what has been done about it?. *Oxford Review of Education*, 44(4), 476-493.

Jogezai, N. A., & Baloch, F. A. (2023). Native, addict, innovator: young teachers' digital competence in the post-COVID-19 instructional era. *International Journal of Educational Management*, 37(6/7), 1382-1400.

Jordan, M., Kornowski, G., Lin, T., Shamir, O., &Zampetakis, M. (2023), July). Deterministic nonsmooth nonconvex optimization. *In The Thirty Sixth Annual Conference on Learning Theory* (pp. 4570-4597). PMLR.

José, H., Oliveira, C., Costa, E., Matos, F., Pacheco, E., Nave, F., ... & Sousa, L. (2023), February). Anxiety and Depression in the Initial Stage of the COVID-19 Outbreak in a Portuguese Sample: Exploratory Study. *In Healthcare* (Vol. 11, No. 5, p. 659). MDPI.

The impact of the COVID-19 pandemic on self-harm and suicidal behaviour: update of living systematic review. F1000Research, 9.

Kabir, I., Abdullahi, Y. A., & Naqshbandi, M. M. (2023). Measuring entrepreneurial orientation and institutional theory for informal enterprises: scale validation. *Quality & Quantity*, 57(2), 1439-1463.

Kalla, D., Smith, N., Samaah, F., &Polimetla, K. (2024). Hybrid Scalable Researcher Recommendation System Using Azure Data Lake Analytics. Journal of Data Analysis and Information Processing, 12, 76-88.

Kaplan-Rakowski, R., & Feldman, A. (2022). The role of training and support in technology integration: A systematic review. *Computers & Education*, 175, 104323.

Karame, J. I., Mangantar, M., & Gunawan, E. (2023). Factors Affecting online Purchase Decision of Generation in Shopee Application. Jurnal Emba: *Journal Riset Ekonomi, Manajemen, Bisnis dan Akuntansi*, 11(1), 248-258.

Kartal, E., & Uzun, A. M. (2022). Investigating the effect of synchronous and asynchronous online learning on student engagement and motivation. *Journal of Educational Computing Research*, 60(4), 831-854.

Kemp, A. I., Vervoort, J. D., Petersson, A., Smithies, R. H., & Lu, Y. (2023). A linked evolution for granite-greenstone terranes of the Pilbara Craton from Nd and Hf isotopes, with implications for Archean continental growth. *Earth and Planetary Science Letters*, 601, 117895.

Khan, F., & Jawaid, M. (2023). Research Leadership in Institutions: Barriers & Enablers. Kozol et al, m (2020). The effects of instruction manipulation on motor performance following action observation. *Frontiers in human neuroscience*, 14, 33.

Kostons, D. (2019). Does Cooperative Use of Reading Strategies lead to Improved Text Comprehension?.*Pedagogischestudien*, 96(2), 123-135.

Kundu, Arnab, and Tripti Bej (2021). "We have efficacy but lack infrastructure: teachers' views on online teaching learning during COVID-19." *Quality Assurance in Education* 29, no. 4 344-372.

Kvavik, M. (2023). Differential equations and some of their applications in chemistry (Bachelor's thesis, uis).

Kavitha, R., Jothi, D. K., Saravanan, K., Swain, M. P., Gonzáles, J. L. A., Bhardwaj, R. J., & Adomako, E. (2023). Ant Colony Optimization-Enabled CNN Deep Learning Technique for Accurate Detection of Cervical Cancer. *BioMed Research International*, 2023.

Kaur, H., Kaushik, S., Singh, G., Kumar, A., Singh, S., Chatterjee, T., ... & Khurana, A. (2023). Homeopathy as an adjuvant to standard care in moderate and severe cases of COVID-19: a single-blind, randomized, placebo-controlled study. *Homeopathy*, 112(03), 184-197.

Kemei, P. (2018). The Relationship Between Corporate Governance and Financial Performance in the Insurance Industry in Kenya (Doctoral thesis, University of Nairobi).

Kemp, A, Palmer, E, &Strelan, P. (2019). A taxonomy of factors affecting attitudes towards educational technologies for use with technology acceptance models. *British Journal of Educational Technology*, 50(5), 2394-2413.

Khaddage, F., Müller, W., & Flintoff, K. (2016). Advancing mobile learning in formal and informal settings via mobile app technology: Where to from here, and how? *Journal of Educational Technology & Society,* 19(3), 16-26.

Khalid, M., Zafar, M., Shafiq, I., Braga, A. A., Haroon, M., & Ahamad, T. (2024). Synergistic charge-transfer dynamics of rigid fused and unfused backbone with donors lead to promising photovoltaic properties of diazaborinine-based chromophores. *Materials Science in Semiconductor Processing*, 182, 108695.

Khamidovna, P. O. (2023). Features of the Use of Modern Didactic Tools in Technical Higher Educational Institutions. *Telematique*, 7630-7634.

Khan, A. U., Zhang, Z., Chohan, S. R., & Rafique, W. (2022). Factors fostering the success of IoT services in academic libraries: a study built to enhance the library performance. *Library Hi Tech*, 40(6), 1976-1995.

Kim, J., & Lee, J. C. (2020). Effects of COVID-19 on preferences for private dining facilities in restaurants. *Journal of Hospitality and Tourism Management,* 45, 67-70.

Knezek, G., Christensen, R., & Norton, S. (2024,). Using a Simulated Teaching Environment to Support Career Technical Teacher Education High School Programs. *In EdMedia+ Innovate Learning* (pp. 846-856). Association for the Advancement of Computing in Education (AACE).

Knezek, G., & Christensen, R. (2023,). Preservice Teachers' Technology Experiences and TPACK Core: Enhancing the WST Model of Technology Integration. In EdMedia+ Innovate Learning (pp. 376-385). *Association for the Advancement of Computing in Education* (AACE).

Knezek, G., & Christensen, R. (2020). The impact of gender on computer science education: A meta-analysis. *Journal of Educational Computing Research,* 58(4), 751-774.

Koehler, M. J., Mishra, P., & Cain, W. (2020). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education,* 20(2), 1-18.

Kok, F. J., Zarnkow, M., &Sierksma, A. (2023). Principles of engagement on research and other collaborations between the brewing sector and research entities: The FACT Principles. *British Journal of Nutrition*, 1-8.

Konovalova, M. Y., Plyusnina, O. V., & Fedotova, E. V. (2023). Labour market flexibility as a factor in economic recovery after the COVID-19 pandemic. *Journal of New Economy (переводнаяверсия),* 24(4), 64-81.

Kooli, C. (2023). Chatbots in Education and Research: A Critical Examination of Ethical Implications and Solutions. *Sustainability*, 15(7), 5614.

Koyuncu, Y. (2019). An Evaluation of Mixed Methods Studies: A Case Study for Turkey.

Kunisch, S., Denyer, D., Bartunek, J. M., Menz, M., & Cardinal, L. B. (2023). Review Research as Scientific Inquiry. *Organisational Research Methods*, 26(1), 3-45.

Ladson, D. K. (2024). Model for Measuring US Army Warfighter's Critical Thinking Skills: A Meta-Analysis (Doctoral thesis, Walden University).

Lazar, S. (2023). Leadership And Innovativeness As The Basis For Developing Teachers'digital Competences.ВестникРоссийскогоуниверситетадружбынародов. *Серия: Психология и педагогика,* 20(1), 126-144.

L. Haven, T., & Van Grootel, D. L. (2019). Preregistering qualitative research. *Accountability in research*, 26(3), 229-244.

Lai, Y. (2016). Understanding the role of technology in education: A review of the literature. *Journal of Educational Technology Development and Exchange,* 9(1), 1-24.

Lan, T. T. N. (2023). Market development strategy of renewable energy industry in Vietnam. *International journal of business and globalisation.* vol: 2353-374.

Lee, Lennard YW, Jean-Baptiste Cazier, Vasileios Angelis, Roland Arnold, Vartika Bisht, Naomi A. Campton, Julia Chackathayil et al., (2020) "COVID-19 mortality in patients with cancer on chemotherapy or other anticancer treatments: a prospective cohort study." *The Lancet* 395, no. 10241 1919-1926.

Lee, M., Sanz, L. R., Barra, A., Wolff, A., Nieminen, J. O., Boly, M., ... & Lee, S. W. (2022). Quantifying arousal and awareness in altered states of consciousness using interpretable deep learning. *Nature communications*, 13(1), 1064.

Lehdonvirta, V., Oksanen, A., Räsänen, P., & Blank, G. (2021). Social media, web, and panel surveys: using non- probability samples in social and policy research. *Policy & internet*, 13(1), 134-155.

Liao, Y. H., Zheng, J. Q., Zheng, C. M., Lu, K. C., & Chao, Y. C. (2020). Novel molecular evidence related to COVID-19 in patients with diabetes mellitus. *Journal of clinical medicine*, 9(12), 3962.

Leja, J., Speagle, J. S., Ting, Y. S., Johnson, B. D., Conroy, C., Whitaker, K. E., ... & Franx, M. (2022). A New Census of the 0.2< z< 3.0 Universe. II. The Star-forming Sequence. *The Astrophysical Journal*, 936(2), 165.

Lincoln, Y. S., Lynham, S. A., & Guba, E. G. (2018). Paradigmatic controversies, contradictions, and emerging confluences. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (5th ed., pp. 108-150). Sage Publications.

Linneberg, M. S., & Korsgaard, S. (2019). Coding qualitative data: A synthesis guiding the novice. *Qualitative research journal*, 19(3), 259-270.

Liao, Y. H., Zheng, J. Q., Zheng, C. M., Lu, K. C., & Chao, Y. C. (2020). Novel molecular evidence related to COVID-19 in patients with diabetes mellitus. *Journal of clinical medicine*, 9(12), 3962.

Lynch, S. M., & Bartlett, B. (2019). Bayesian statistics in sociology: Past, present, and future. *Annual Review of Sociology*, 45(1), 47-68.

Luan, H., Geczy, P., Lai, H., Gobert, J., Yang, S. J., Ogata, H., ... & Tsai, C. C. (2020). Challenges and future directions of big data and artificial intelligence in education. *Frontiers in psychology*, 11, 580820.

Lung, G. (2021). Precise Correction of A1AT E342K by Modified NGA PAM Prime Editing and Determination of Prime Editing Inhibition by TREX2 (Master's thesis, Harvard University).

Lin, H. W, Teegmark, M & Rolnick, D. (2017). Why does deep and cheap learning work so well?. *Journal of Statistical Physics*, 168, 1223-1247.

Liu, J., Liu, C., Zhou, P., Lv, R., Zhou, K., & Zhang, Y. (2023). Is chatgpt a good recommender? a preliminary study. arXiv preprint arXiv:2304.10149.

Liu, X., Lu, D., Zhang, A., Liu, Q., & Jiang, G. (2022). Data-driven machine learning in environmental pollution: Gains and problems. *Environmental science & technology*, 56(4), 2124- 2133.

Lorenz-Spreen, P., Oswald, L., Lewandowsky, S., & Hertwig, R. (2023). A systematic review of worldwide causal and correlational evidence on digital media and democracy. *Nature human behaviour,* 7(1), 74-101. 2133.

Lorette, P. (2023). Opportunities and challenges of positionality in quantitative research: overcoming linguistic and cultural 'knowledge gaps' thanks to 'knowledgeable collaborators. *Journal of Multilingual and Multicultural Development,* 1-15.

Lutfi, A., Alrawad, M., Alsyouf, A., Almaiah, M. A., Al-Khasawneh, A., Al-Khasawneh, A. L., ... & Ibrahim, N. (2023). Drivers and impact of big data analytic adoption in the retail industry: A quantitative investigation applying structural equation modelling. *Journal of Retailing and Consumer Services,* 70, 103129.

Maarouf, H. (2019). Pragmatism as a supportive paradigm for the mixed research approach: Conceptualizing the ontological, epistemological, and axiological stances of pragmatism. *International Business Research,* 12(9), 1-12.

Mabrouk, F. (2023). Tunisian EFL Learners' Perceptions of the Use of Oral Presentations in Assessing Speaking Skills: An Exploratory Practice Study. *Studies in Applied Linguistics & TESOL,* 23(2), 18-40.

Manduku, E., Omagwa, J., & Mwenda, N. (2023). Corporate Governance And Financial Performance Of Quasi-Government Organizations In Kenya. *Academic Journal of Social Sciences and Education,* 11(1).

Mapleson, D., Garcia Accinelli, G., Kettleborough, G., Wright, J., & Clavijo, B. J. (2017). KAT: a K-mer analysis toolkit to quality control NGS datasets and genome assemblies. *Bioinformatics,* 33(4), 574-576.

Mapleson, D., Garcia Accinelli, G., Kettleborough, G., Wright, J., & Clavijo, B. J. (2017). KAT: a K-mer analysis toolkit to quality control NGS datasets and genome assemblies. *Bioinformatics,* 33(4), 574-576.

Molenda, M. (2017). Programmed instruction. Foundations of Learning and Instructional Design Technology.

Molteni, M. (2024). Credit expansion, leverage, and banking distress: the puzzle of interwar Italy. *European Review of Economic History*, 28(1), 1-27.

Mwembe, D., Shoniwa, L., & Ngwenya, S. Determinants Of Hospitalisation Of Covid-19 Patients: A Two-Year Retrospective Study At An Infectious Disease Hospital In Bulawayo, Zimbabwe.

Marti, L., Wu, S., Piantadosi, S. T., & Kidd, C. (2023). Latent diversity in human concepts. *Open Mind*, 7, 79-92.

Martzoukou, K., Panayiotakis, I., Herbert, N., Grey, E., & MacDonald, N. (2023). 'Maddie is Online': A Creative Learning Path to Digital Literacy for Young People. *Computers in the Schools*, 1-30.

March, J. (2020). The technology of foolishness. *In Shaping Entrepreneurship Research* (pp. 120-130). Routledge.

Martín-García, A. V., Redolat, R., &Pinazo-Hernandis, S. (2022). Factors Influencing Intention to Technological Use in Older Adults. *The TAM Model Aplication. Research on Aging*, 44(7-8), 573-588.

Matthias, I. (2024). human-robot-relationships einefeministische intervention am beispiel von sex robots. *GenderErträge* V, 50.

Mayer, R. E. (2024). The past, present, and future of the cognitive theory of multimedia learning. *Educational Psychology Review*, 36(1), 8.

Mazari, I. (2022). Quantitative estimates for parabolic optimal control problems under L∞ and L1 constraints in the ball: Quantifying parabolic isoperimetric inequalities. *Nonlinear Analysis*, 215, 112649.

Maxfield, F. R., Steinfeld, N., & Ma, C. I. J. (2023). The formation and consequences of cholesterol-rich deposits in atherosclerotic lesions. *Frontiers in Cardiovascular Medicine*, 10, 1148304.

Maxfield, H. (2019). Quantum corrections to the BTZ black hole extremality bound from the conformal bootstrap. *Journal of High Energy Physics,* 2019(12), 1-44.

Masters, K. (2023). Ethical use of artificial intelligence in health professions education: AMEE Guide No. 158. *Medical Teacher*, 1-11.

Maune, A. (2023). Adoption and use of eLearning platforms by universities in developing countries: Evidence from Zimbabwe. *Cogent Education,* 10(2), 2287905.

McCallister, A. (2019). The Technical Challenges of Implementing Gamification: A Qualitative Exploratory Case Study (Doctoral thesis, Capella University).

McDonald, N., Schoenebeck, S., & Forte, A. (2019). Reliability and inter-rater reliability in qualitative research: Norms and guidelines for CSCW and HCI practice. *Proceedings of the ACM on human-computer interaction,* 3(CSCW), 1-23.

Mclnnis, J. M. (2015). Is Iran recalibrating in Syria. Iran Tracker Weekly Report, Week of December 14.

Mehrolia, S., Alagarsamy, S., &Solaikutty, V. M. (2021). Customers' response to online food delivery services during COVID- 19 outbreak using binary logistic regression. *International journal of consumer studies,* 45(3), 396-408.

Menken, C. M., &Toepoel, V. (2023). How to Optimize Online Mixed-Device Surveys: The Effects of a Messenger Survey, Answer Scales, *Devices and Personal Characteristics. Methods, data, analyses,* 17(1), 24.

Merton, R. K. (2020). The sociology of science: Theoretical and empirical investigations. Chicago University Press.

Merriam, S. B. (2020). Adult learning: Linking theory and practice. *Jossey-Bass.* doi: 978-1-119-71343-4.

Mhlanga, D., & Moloi, T. (2020). COVID-19 and the digital transformation of education: What are we learning on 4IR in South Africa? *Education sciences,* 10(7), 180.

Mhlanga, D., Denhere, V., & Moloi, T. (2022). COVID-19 and the Key Digital Transformation Lessons for Higher Education Institutions in South Africa. *Education Sciences*, 12(7), 464.

Miller, R. K. (2006). The impact of educational technology on learner interactions: A multiple case study of elementary classrooms (Doctoral thesis).

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers' college record,* 108(6), 1017-1054.

Mlekus, L, Bentler, D, Paruzel, A, Kato-Beiderwieden, A. L, & Maier, G. W. (2020). How to raise technology acceptance user experience characteristics as technology-inherent determinants. Gruppe. Interaktion. Organization. Zeitschrift fur AngewandteOrganisationspsychologie (GIO), 51(3), 273-283.

Moffat, K. R., Shi, W., Cannon, P., & Sullivan, F. (2023). Factors associated with recruitment to randomised controlled trials in general practice: a systematic mixed studies review. *Trials*, 24(1), 1-19.

Mohsin, A., Rehman, A. U., Cheema, H. A., Zahid, A., Rehman, M. E. U., Ameer, M. Z., ... & Khawaja, A. (2023). Comparative efficacy and safety of tenecteplase and alteplase in acute ischemic stroke: a pairwise and network meta-analysis of randomized controlled trials. *Journal of the Neurological Sciences*, 445, 120537.

Möller, K., & Halinen, A. (2022). Clearing the paradigmatic fog—how to move forward in business marketing research. *Industrial Marketing Management*, 102, 280-300.

Moncrieff, J., Cooper, R. E., Stockmann, T., Amendola, S., Hengartner, M. P., & Horowitz, M. A. (2022). The serotonin theory of depression: a systematic umbrella review of the evidence. *Molecular psychiatry*, 1-14.

Montag, C., & Diefenbach, S. (2018). Towards homo digitalis: important research issues for psychology and the neurosciences at the dawn of the internet of things and the digital society. *Sustainability*, 10(2), 415.

Montgomery, T. D., Buchbinder, J. R., Gawalt, E. S., Iuliucci, R. J., Koch, A. S., Kotsikorou, E., ... &Evanseck, J. D. (2022). The Scientific Method as a Scaffold to Enhance Communication Skills in Chemistry. *Journal of chemical education*, 99(6), 2338-2350.

Munyoro, J. (2020). Optimizing humanitarian food relief distribution through local clusters (master's thesis, Hanken School of Economics).

Moodie, G. (2002). Identifying vocational education and training. *Journal of vocational education and training*, 54(2), 249-266.

Morgan, H. (2022). Conducting a Qualitative Document Analysis. *Qualitative report*, 27(1).

Moseley, R. L., Liu, C. H., Gregory, N. J., Smith, P., Baron-Cohen, S., & Sui, J. (2022). Levels of self-representation and their sociocognitive correlates in late-diagnosed autistic adults. *Journal of Autism and Developmental Disorders*, 52(7), 3246-3259.

Murray-Watters, A., Zins, S., Silber, H., Gummer, T., & Lechner, C. M. (2023). River Sampling–a Fishing Expedition: A Non-Probability Case Study. Methods, *Data, Analyses*, 17(1), 25.

Musonye, H. A., He, Y. S., Bekele, M. B., Jiang, L. Q., Cao, F., Xu, Y. Q., ... & Pan, H. F. (2024). Exploring the Association between Ambient Air Pollution and COVID-19 Risk: A Comprehensive Meta-Analysis with Meta-Regression Modelling. *Heliyon.*

Muyambo-Goto, O., Naidoo, D., & Kennedy, K. J. (2023). Students' conceptions of 21st century education in Zimbabwe. *Interchange*, 54(1), 49-80.

Muwaniki, C., McGrath, S., Manzeke-Kangara, M. G., Wedekindv, V., & Chamboko, T. (2022). Curriculum reform in agricultural vocational education and training in Zimbabwe: Implementation challenges and possibilities. *Journal of Vocational, Adult and Continuing Education and Training*, 5(1), 22-22.

Muzaffar, A., Hassen, H. R., Zantout, H., & Lones, M. A. (2024). ActDroid: An active learning framework for Android malware detection. arXiv preprint arXiv:2401.16982.

Muzari, T., Shava, G. N., & Shonhiwa, S. (2022). Qualitative research paradigm, a key research design for educational researchers, processes and procedures: A theoretical overview. *Indiana Journal of Humanities and Social Sciences,* 3(1), 14-20.

Muzurura, J., Mutambara, E., &Mataruka, L. (2023). Straitening The Audit Expectation Gap In Zimbabwe's Public Sector: Doing Things Right Versus Doing The Right Things. *Journal of Namibian Studies: History Politics Culture,* 33, 556-575.

Nassoura, A. B. (2024). Navigating Data Warehousing Implementation in Jordanian Healthcare Sector: Challenges and Opportunities. *South Eastern European Journal of Public Health*, 85-97.

Nath, B., Sarkar, S., Das, S., & Mukhopadhyay, S. (2024). Neural machine translation for Indian language pair using hybrid attention mechanism. Innovations in Systems and Software Engineering, 20(2), 175-183.

Nearing, J. T., Douglas, G. M., Hayes, M. G., MacDonald, J., Desai, D. K., Allward, N., ... & Langille, M. G. (2022). Microbiome differential abundance methods produce different results across 38 datasets. *Nature Communications,* 13(1), 342.

Neelakanta, G., & Sultana, H. (2022). Tick saliva and salivary glands: what do we know so far on their role in arthropod blood feeding and pathogen transmission. *Frontiers in cellular and infection microbiology,* 11, 816547.

Neetu, R. R., Ghatak, G., Bohara, V. A., & Srivastava, A. (2023). Performance Analysis of Cache-Enabled Handover Management for Vehicular Networks. IEEE *Transactions on Network Science and Engineering.*

Nguyen, T. T., Nguyen, T. T., & Nguyen, T. T. (2022). Investigating the impact of training on facilitators' confidence and proficiency in using educational technology. *Journal of Educational Technology Development and Exchange,* 15(1), 1-22.

Nherera, C. M. (2000). Globalisation, qualifications and livelihoods: The case of Zimbabwe. *Assessment in Education: Principles, Policy & Practice,* 7(3), 335-362.

Nishii, L. H., & Leroy, H. (2022). A multi-level framework of inclusive leadership in organisations. *Group & Organisation Management*, 47(4), 683-722.

Norman, J. E., Lawton, J., Stock, S. J., Siassakos, D., Norrie, J., Hallowell, N., ... & Whyte, S. (2021). Qualitative research. In Feasibility and design of a trial regarding the optimal mode of delivery for preterm birth: the CASSAVA multiple methods study. NIHR *Journals Library.*

Nsabayezu, E., Iyamuremye, A., Mbonyiryivuze, A., Niyonzima, F. N., & Mukiza, J. (2023). 'Digital-based formative assessment to support graduates' learning of organic chemistry in selected secondary schools of Nyarugenge District in Rwanda. *Education and Information Technologies*, 1-31.

Núñez-Canal, M., Sanz Ponce, R., Azqueta, A., & Montoro-Fernández, E. (2023). How effective is entrepreneurship education in schools? An empirical study of the new curriculum in Spain. *Education Sciences*, 13(7), 740.

Oberauer, K., & Lewandowsky, S. (2019). Addressing the theory crisis in psychology. *Psychonomic bulletin & review*, 26, 1596-1618.

Obermayer, N., Kővári, E., Leinonen, J., Bak, G., & Valeri, M. (2022). How social media practices shape family business performance: the wine industry case study. *European Management Journal*, 40(3), 360-371.

Odanga, A. M., Omuterema, O. S., &Oteki, E. B. (2021). Factors Influencing Learning Programmememes in Technical and Vocational Training Institutions in Kenya during Covid 19 Pandemic: A Case Study of TVETs in Western Kenya

OECD (2019). An OECD Learning Framework 2030. The Future of Education and Labor, 23-35.

Ohei, K. N., Brink, R., & Abiodun, A. (2019). Information and Communication Technology (ICT) graduates and challenges of employability: A conceptual framework for enhancing employment opportunities in South Africa. *Gender and Behaviour*, 17(3), 13500-13521.

Otieno, J. O. (2023). Mixed Methods in Accounting Research: The Rationale and Research Designs.

Oxford English Dictionary 2022). Oxford English Dictionary (3rd ed.). Oxford University Press.

Oxford English Dictionary (2023). Oxford English Dictionary (4th ed.). Oxford University Press.

Pace, D. S. (2021). Probability and non-probability sampling-an entry point for undergraduate researchers. *International Journal of Quantitative and Qualitative Research Methods,* 9(2), 1-15.

Pal, D., Zhang, X., & Siyal, S. (2021). Prohibitive factors to the acceptance of Internet of Things (IoT) technology in society: A smart-home context using a resistive modelling approach. *Technology in Society,* 66, 101683.

Patel, A. B., & Verma, A. (2020). COVID-19 and angiotensin-converting enzyme inhibitors and angiotensin receptor blockers: what is the evidence?. *Jama,* 323(18), 1769-1770.

Pathan, A., Memon, T. D., & Mangi, R. A. (2024). A correlation-less approach toward the steepest-descent-based adaptive channel equalizer. Circuits, Systems, and Signal Processing, 43(4), 2171-2183.

Pandey, P., & Pandey, M. M. (2021). Research methodology tools and techniques. Bridge Centre.

Pang, Z., Zhou, G., Ewald, J., Chang, L., Hacariz, O., Basu, N., & Xia, J. (2022). Using MetaboAnalyst 5.0 for LC–HRMS spectra processing, multi-omics integration and covariate adjustment of global metabolomics data. *Nature Protocols,* 17(8), 1735-1761.

Paris, B., Reynolds, R., & McGowan, C. (2022). Sins of omission: Critical informatics perspectives on privacy in e- learning systems in higher education. *Journal of the Association for Information Science and Technology*, 73(5), 708-725.

Park, I., Kim, D., Moon, J., Kim, S., Kang, Y., & Bae, S. (2022). Searching for new technology acceptance model under social context: analyzing the determinants of acceptance of

intelligent information technology in digital transformation and implications for the requisites of digital sustainability. *Sustainability*, 14(1), 579.

Park, S., & Kim, S. (2022). Identifying world types to deliver gameful experiences for sustainable learning in the metaverse. *Sustainability*, 14(3), 1361.

Pérez Pérez, M., Obeso Becerra, M., García Piqueres, G., & Serrano Bedia, A. M. (2023). Enhancing students' learning outcomes through smartphones: a case study of using instagram in higher management education.

Park, Y. S., Konge, L., & Artino, A. R. (2020). The positivism paradigm of research. *Academic Medicine*, 95(5), 690-694.

Paudel, S. (2019). Entrepreneurial leadership and business performance: Effect of organisational innovation and environmental dynamism. *South Asian Journal of Business Studies.*

Pearl, J., &Bareinboim, E. (2022). External validity: From do-calculus to transportability across populations. In Probabilistic and causal inference: *The works of Judea Pearl* (pp. 451-482).

Pearlman, W. E. N. D. Y. (2022). Emotional Sensibility: Exploring the Methodological and Ethical Implications of Research Participants' Emotions. *American Political Science Review*, 1-14.

Pellicano, E., & den Houting, J. (2022). Annual Research Review: Shifting from 'normal science'to neurodiversity in autism science. *Journal of Child Psychology and Psychiatry*, 63(4), 381-396.

Pfaffe, L. D. (2017). Using the SAMR model as a framework for evaluating Learning activities and supporting a transformation of learning. *St. John's University* (New York).

Phuthi, N., & Mazarire, T. (2022). Technical and vocational education provision in Zimbabwe: leveraging institutional support for learners with special educational needs. *Journal of Vocational Education & Training*, 1-20.

Portnoy, J., & Schwartz, J. A. (2023). Adolescent violent delinquency associated with increased emergency department usage in young adulthood. *International journal of offender therapy and comparative criminology*, 67(8), 739-756.

Pullong, A., Mokhtar, S., Mokhtar, R. A. M., & Rahman, N. A. (2023). Kepercayaan Bulan Sial Dalam Masyarakat Bajau Kota Belud, Sabah. *Journal of Islamic, Social, Economics and Development*, 8(53).

Quinlan, K. M., & Corbin, J. (2023). How and why do students' career interests change during higher education?. *Studies in Higher Education*, 48(6), 771-783.

Pan, R., Hu, D., Chao, J., Han, X., Jia, H., & Li, C. (2023). Oxidation and exothermic properties of long flame coal spontaneous combustion under solid-liquid-gas coexistence and its microscopic mechanism analysis. *Science of The Total Environment*, 895, 165206.

Pimenov, D. Y., Bustillo, A., Wojciechowski, S., Sharma, V. S., Gupta, M. K., & Kuntoğlu, M. (2022). Artificial intelligence systems for tool condition monitoring in machining: Analysis and critical review. *Journal of Intelligent Manufacturing*, 1-43.

Pisano, G. P. (1997). The development factory: unlocking the potential of process innovation. *Harvard Business Press.*

Prabhakar, P., Arora, S., Khosla, A., Beniwal, R. K., Arthur, M. N., Arias-Gonzáles, J. L., & Areche, F. O. (2022). Cyber Security of Smart Metering Infrastructure Using Median Absolute Deviation Methodology. *Security and Communication Networks*, 2022.

Purwanto, A. (2022). The Role of Digital Leadership, e-loyalty, e-service Quality and e-satisfaction of Indonesian E-commerce Online Shop. *International Journal of Social and Management Studies*, 3(5), 51-57.

Qerimi, I., Kastrati, S., Maloku, A., Gabela, O., & Maloku, E. (2023). The Importance of Theory and Scientific Theories for the Scientific Study of Genocide in the Context of the Contribution to the Development of the Science of Genocide. *Academic Journal of Interdisciplinary Studies*, 12(1), 183.

Radford, J., Green, J., Quintana, A., Safarpour, A., Simonson, M. D., Baum, M., ... & Druckman, J. (2022). Evaluating the generalizability of the COVID States survey—*a large-scale, non-probability survey.*

Radha, R., Mahalakshmi, K., & Suresh, M. (2020). Enhancement of Educational Technology using 5G Networks. *Journal of Emerging Technologies in Learning*, 17(3), 1-12.

Rafique, H., Almagrabi, A. O., Shamim, A., Anwar, F., & Bashir, A. K. (2020). Investigating the acceptance of mobile library applications with an extended technology acceptance model (TAM). *Computers & Education*, 145, 103732.

Raifman, S., DeVost, M. A., Digitale, J. C., Chen, Y. H., & Morris, M. D. (2022). Respondent-driven sampling: a sampling method for hard-to-reach populations and beyond. *Current Epidemiology Reports*, 9(1), 38-47.

Ralph, J. (2023). On Global Learning. Pragmatic Constructivism, *International Practices and the Challenge of Global Governance*

Rashid, Y., Rashid, A., Warraich, M. A., Sabir, S. S., & Waseem, A. (2019). Case study method: A step-by-step guide for business researchers. *International journal of qualitative methods*, 18, 1609406919862424.

Read, B., Wolters, L., & Berinsky, A. J. (2022). Racing the clock: Using response time as a proxy for attentiveness on self-administered surveys. *Political Analysis*, 30(4), 550-569.

Reisner, S. L., & Hughto, J. M. (2019). Comparing the health of non-binary and binary transgender adults in a statewide non-probability sample. *PLoS one*, 14(8), e0221583.

Reshi, I. A., & Sudha, T. (2023). Women's Economic Involvement and Self-Help Groups in the Pulwama District of Jammu and Kashmir. *Morfai Journal*, 2(4), 872-882.

Reynolds, C. R., Altmann, R. A., & Allen, D. N. (2021). The problem of bias in psychological assessment. *In Mastering Modern Psychological Testing: Theory and Methods* (pp. 573-613). Cham: Springer International Publishing.

Reza, L., Gottgens, K., Kleijnen, J., Breukink, S., Ambe, P. C., Aigner, F., ... & Zimmerman, D. (2024). European Society of Coloproctology: Guidelines for diagnosis and treatment of cryptoglandular anal fistula. *Colorectal Disease,* 26(1), 145-196.

Riedel, P. L., Kreh, A., Kulcar, V., Lieber, A., & Juen, B. (2022). A scoping review of moral stressors, moral distress and moral injury in healthcare workers during COVID-19. *International Journal of Environmental Research and Public Health,* 19(3), 1666.

Riley, R. D., Collins, G. S., Ensor, J., Archer, L., Booth, S., Mozumder, S. I.,& Snell, K. I. (2022). Minimum sample size calculations for external validation of a clinical prediction model with a time- to- event outcome. *Statistics in Medicine,* 41(7), 1280-1295.

Robinson, V., Meyer, F., Le Fevre, D., & Sinnema, C. (2021). The quality of leaders' problem-solving conversations: *Truth-seeking or truth-claiming? Leadership and Policy in Schools,* 20(4), 650-671.

Rodriguez, P., Nussbaum, M., & Dombrovskaia, L. (2020). Teacher competency and technology integration: A systematic review. *Journal of Educational Computing Research,* 58(4), 775-797.

Rogers, E. M., & Singhal, A. (2003). Empowerment and communication: Lessons learned from organizing for social change. *Annals of the International Communication Association,* 27(1), 67-85.

Romanowska-Dixon, Bożena, et al., (2024), "Impact of the SARS-CoV-2 (COVID-19) Pandemic on Characteristics and Management of Uveal Melanoma in the National Referral Center in Poland." *Cancers* 16.11 (2024): 2061.

Rose, J., & Johnson, C. W. (2020). Contextualizing reliability and validity in qualitative research: Toward more rigorous and trustworthy qualitative social science in leisure research. *Journal of leisure research,* 51(4), 432-451.

Ruslin, R., Mashuri, S., Rasak, M. S. A., Alhabsyi, F., & Syam, H. (2022). Semi-structured Interview: A methodological reflection on the development of a qualitative research

instrument in educational studies. IOSR *Journal of Research & Method in Education* (IOSR-JRME), 12(1), 22-29.

Ruuska, K. (2020). At the nexus of language, identity and ideo0logy: Becoming and being a highly proficient second language speaker of Finnish. JYU thesiss.

Salloum, S. A. (2024). Detecting Malicious Accounts in Cyberspace: Enhancing Security in ChatGPT and Beyond. In Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom (pp. 653-666). Cham: Springer Nature Switzerland.

Sanchez, J. I., Bonache, J., Paz-Aparicio, C., &Oberty, C. Z. (2023). Combining interpretivism and positivism in international business research: the example of the expatriate role. *Journal of World Business*, 58(2), 101419.

Santhanam, S. P. (2023). An Interactive and Neurodiversity-Affirming Approach to Communication Supports for Autistic Graduatesthrough Videogaming. *Language, Speech, and Hearing Services in Schools*, 1-20.

Santoso, H. B., & So, H. J. (2022). Facilitators' confidence and proficiency in using technology: A systematic review. *Journal of Educational Technology & Society*, 25(1), 1-18.

Saunders, M. N. K., Booth, P., & Liu, Y. (2020). Paradigms and philosophies in social research. In M. N. K. Saunders & P. Booth (Eds.), *Research methods for business graduates* (8th ed., pp. 45-64). Pearson Education Limited.

Scheid, B. H. (2023). Quantitative Methods for Improving Neurostimulation Therapy in Epilepsy (Doctoral thesis, University of Pennsylvania).

Scherer, R., Siddiq, F., &Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education*, 128, 13-35.

Schildkamp, K., Wopereis, I., Kat-De Jong, M., Peet, A., &Hoetjes, I. (2020). Building blocks of instructor professional development for innovative ICT use during a pandemic. *Journal of Professional Capital and Community*, 5(3/4), 281-293.

Scott, H. R., Stevelink, S. A., Gafoor, R., Lamb, D., Carr, E., Bakolis, I., ... & Wessely, S. (2023). Prevalence of post-traumatic stress disorder and common mental disorders in health-care workers in England during the COVID-19 pandemic: a two-phase cross-sectional study. *The Lancet Psychiatry*, 10(1), 40-49.

Sebele-Mpofu, F. Y. (2020). Saturation controversy in qualitative research: Complexities and underlying assumptions. A literature review. *Cogent Social Sciences*, 6(1), 1838706.

Sowcik, M., & Seemiller, C. (2023). Disciplinary perspectives. In A Research Agenda for Leadership Learning and Development through Higher Education (pp. 145-165). Edward Elgar Publishing.

Selim, K. S., & Rezk, S. S. (2023). On predicting school dropouts in Egypt: A machine learning approach. *Education and Information Technologies*, 28(7), 9235-9266.

Serpa, B. M., Serpa, P. R., Xerri, L. L. R., & Suzko, M. (2024). Covid-19 pandemic: and the need to adapt teaching practice. *Observatório De La Economía Latinoamericana*, 22(2), e3104-e3104.

Sharma, D., & Kumar, N. (2022). Instruments Used in the Collection of Data in Research. Available at SSRN 4138751.

Sharma, A., & Gandhi, A. V. (2024). Consumer adoption study for innovative technology products and services in an emerging economy. *International Journal of Innovation Science*, 16(3), 482-500.

Shokhzod, N. (2023,). Methods of Teaching Computer Science. *In E Conference Zone* (pp. 51-53).

Shortt, M., Tilak, S., Kuznetcova, I., Martens, B., &Akinkuolie, B. (2021). Gamification in mobile-assisted language learning: A systematic review of Duolingo literature from public release of 2012 to early 2020. *Computer Assisted Language Learning*, 1-38.

Singh, V., & Thurman, A. (2022). Synchronous online learning environments: A review of the literature. *Journal of Online Learning and Teaching*, 18(1), 1-18.

Sibanda, M., Meyer, J. C., Godman, B., & Burnett, R. J. (2023). Low influenza vaccine uptake by healthcare workers caring for the elderly in South African old age homes and primary healthcare facilities. *BMC Public Health*, 23(1), 1-13.

Sifaki, M., Flouri, E., & Midouhas, E. (2024). Paternal and maternal psychological distress and adolescent health risk behaviors: The role of sensitive periods. *Journal of Adolescence*.

Signé, L. (2023). *Africa's Fourth Industrial Revolution*. Cambridge University Press.

Singh, D., Vignat, J., Lorenzoni, V., Eslahi, M., Ginsburg, O., Lauby-Secretan, B., ... & Vaccarella, S. (2023). Global estimates of incidence and mortality of cervical cancer in 2020: a baseline analysis of the WHO Global Cervical Cancer Elimination Initiative. *The lancet global health*, 11(2), e197-e206.

Singh, A. K., Kumar, A., Mahmud, M., Kaiser, M. S., & Kishore, A. (2024). COVID-19 infection detection from chest X-ray images using hybrid social group optimization and support vector classifier. *Cognitive Computation*, 16(4), 1765-1777.

Sileyew, K. J. (2019). *Research design and methodology* (pp. 1-12). Rijeka: IntechOpen.

Silander, D. (2019). The European Commission and Europe 2020: Smart, sustainable and inclusive growth. *In Smart, sustainable and inclusive growth* (pp. 2-35). Edward Elgar Publishing.

Slimani, N., &Aatta, T. (2023). EflTeachers'attitudes Towards Ict Leadership AndIct Collaboration In High School Education In Morocco.

Slocum, T. A., Pinkelman, S. E., Joslyn, P. R., & Nichols, B. (2022). Threats to internal validity in multiple-baseline design variations. *Perspectives on Behaivour Science*, 45(3), 619-638.

Smith, J. (2022). Enhancing Educational Technology with 5G. *International Journal of Emerging Technologies in Learning*, 17(1), 1-15. IGI Global.

Sobieraj, S., Eimler, S., &Rinkenauer, G. (2023). Can smart glasses change how people evaluate healthcare professionals? A mixed-method approach to using smart glasses in hospitals. *International Journal of Human-Computer Studies*, 178, 103081.

Solakis, K., Katsoni, V., Mahmoud, A. B., & Grigoriou, N. (2022). Factors affecting value co-creation through artificial intelligence in tourism: a general literature review. *Journal of Tourism Futures*, (ahead-of-print).

Staddon, R. V. (2023). Exploring higher education students' perspectives on factors affecting use, attitudes and confidence with learning technologies. *International Journal of Instruction*, 16(2).

Solmi, M., Thompson, T., Estradé, A., Agorastos, A., Radua, J., Cortese, S., ... & Ifteni, P. (2023). Validation of the collaborative outcomes study on health and functioning during infection times (COH-FIT) questionnaire for adults. *Journal of affective disorders*, 326, 249-261.

Somani, C., Taylor, G. D., Garot, E., Rouas, P., Lygidakis, N. A., & Wong, F. S. L. (2022). An update of treatment modalities in children and adolescents with teeth affected by molar incisor hypomineralisation (MIH): a systematic review. *European Archives of Paediatric Dentistry*, 23(1), 39-64.

Stark, N., Bobadilla, L., Michael, P., Saturn, S., & Portner, M. (2023). A meta-analytic review of the relationship between empathy and oxytocin: Implications for application in psychopathy research. *Aggression and Violent Behaivour*, 101828.

Storey, C., Cankurtaran, P., Papastathopoulou, P., & Hultink, E. J. (2016). Success factors for service innovation: A meta- analysis. *Journal of Product Innovation Management*, 33(5), 527-548.

Strober, B., Veitz-Keenan, A., Barna, J. A., Matthews, A. G., Vena, D., Craig, R. G., ... & Thompson, V. P. (2013). Effectiveness of a resin-modified glass ionomer liner in reducing hypersensitivity in posterior restorations: a study from the practitioners engaged

in applied research and learning network. *The Journal of the American Dental Association,* 144(8), 886-897.

Syed, A. M., Ahmad, S., Alaraifi, A., & Rafi, W. (2021). Identification of operational risks impeding the implementation of eLearning in higher education system. *Education and Information Technologies*, 26, 655-671.

Sykes, G., & Elmore, R. F. (1989). Making schools manageable: Policy and administration for tomorrow's schools. *The politics of reforming-school Administration* (The 1988 Yearbook of the politics of Education Association), 77-94.

Taimalu, M., & Luik, P. (2019). The impact of beliefs and knowledge on the integration of technology among teacher educators: A path analysis. *Teaching and teacher Education,* 79, 101-110.

Talbert, R. D. (2020). Racial Disparities in Physical and Mental Health: The Consequences of White Supremacist Organizing, Public Confederate Monuments, and Exposure to Lethal Police Encounters (Doctoral thesis).

Tan, J. (2021). Higher education in Singapore. *International Handbook on Education in South East Asia*, 1-17.

Tantengco, N. S. (2015). Meeting the Challenges of Asean 2015: The Philippine Normal University Social Science Teacher Education Curriculum Initiatives. *Sipatahoenan,* 1(1).

Tavakolan, M., Mostafazadeh, F., Eirdmousa, S. J., Safari, A., & Mirzaei, K. (2022). A parallel computing simulation-based multi-objective optimization framework for economic analysis of building energy retrofit: A case study in Iran. Journal of Building Engineering, 45, 103485.

Thaheem, S. K., Zainol Abidin, M. J., Mirza, Q., & Pathan, H. U. (2022). Online teaching benefits and challenges during pandemic COVID-19: a comparative study of Pakistan and Indonesia. *Asian Education and Development Studies*, 11(2), 311-323.

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education? *Smart Learning Environments*, 10(1), 15.

Tondeur, J, Van Braak, J, Ertmer, P. A, & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education.

Toyon, M. A. S. (2023). Introduction to research: Mastering the basics.

Tuan, L. H. A. (2023). The entrepreneurial pathway of Vietnamese super-rich. The sources of their successful business performance. *International Journal of Entrepreneurship and Small Business.*

Turner, K., Kim, H., Nguyen, N. P., Wu, S., Gujar, A. D., Luebeck, J., ... & Verhaak, R. G. (2020). Extrachromosomal DNA is associated with oncogene amplification and poor outcome across multiple cancers. *Nature genetics*, 52(9), 891-897.

Tuten, T. L. (2023). Social media marketing. Sage publications limited.

Tuzlukaya, Ş., Şahin, N. G. G., &Cigdemoglu, C. (2022). Extending peer-led team learning to management education: The effects on achievement, critical thinking, and interest. The *International Journal of Management Education*, 20(2), 100616.

Ozogur, G., Erturk, M. A., & AYDIN, M. A. (2024). Malware Detection for Android TV. Available at SSRN 4766983.

Ulander-Wänman, C. (2022). Equality and Lifelong Learning: Facilitating Employment Transitions for Ageing Workers in Sweden. *Scandinavian Studies in Law*, 68, 329-346.

UNESCO Institute for Information Tchnologies in Education (2020)

Upoalkpajor, J. L. N., &Upoalkpajor, C. B. (2020). The impact of COVID-19 on education in Ghana. *Asian journal of education and social studies*, 9(1), 23-33.

Taie, S., & Goldring, R. (2020). Characteristics of Public and Private Elementary and Secondary School Teachers in the United States: Results from the 2017-18 National Teacher and Principal Survey. *First Look.* NCES 2020-142. National Center for Education Statistics.

Useche, A. C., Galvis, Á. H., Díaz-Barriga Arceo, F., Patiño Rivera, A. E., & Muñoz-Reyes, C. (2022). Reflexive pedagogy at the heart of educational digital transformation in Latin American higher education institutions. *International Journal of Educational Technology in Higher Education,* 19(1), 62.

Vadakedath, S., & Kandi, V. (2023). Clinical Research: A Review of Study Designs, Hypotheses, Errors, Sampling Types, Ethics, and Informed Consent. *Cureus,* 15(1).

Vahdat, S. (2022). The role of IT-based technologies on the management of human resources in the COVID-19 era. *Kybernetes,* 51(6), 2065-2088.

Van Timmeren, J. E., Cester, D., Tanadini-Lang, S., Alkadhi, H., & Baessler, B. (2020). Radiomics in medical imaging "how-to" guide and critical reflection. *Insights into imaging,* 11(1), 1-16.

Vandenberg, S. E., Stephens, K. R., & Stephenson, R. (2020). Demographic differences in computer science education: A systematic review. *Computer Science Education,* 30(1), 1-25.

Vasileiou, E., Georgantzis, N., Attanasi, G., & Llerena, P. (2024). The role of innovation portfolio in green innovation decisions: *A study of French and Italian firms. Technovation,* 130, 102921.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2017). Unified theory of acceptance and use of technology: A synthesis and meta-analysis. *MIS Quarterly,* 41(2), 431-455. doi: 10.25300/MISQ/2017/41.2.03

Venkatesh, V. (2022). Adoption and use of AI tools: a research agenda grounded in UTAUT. *Annals of Operations Research,* 308(1), 641-652.

Verstegen, J. A., van der Laan, C., Dekker, S. C., Faaij, A. P., & Santos, M. J. (2019). Recent and projected impacts of land use and land cover changes on carbon stocks and biodiversity in East Kalimantan, Indonesia. *Ecological Indicators*, 103, 563-575.

Vogl, S. (2023). Mixed methods longitudinal research. In Forum Qualitative Sozialforschung/Forum: Qualitative Social Research (Vol. 24, No. 1).

Walberg, G. (2020). The All Events Tests in an Era of Self-Regulation. *Wm. & Mary Bus. L. Rev.*, 12, 329.

Walker, P. G., Whittaker, C., Watson, O. J., Baguelin, M., Winskill, P., Hamlet, A., ... & Ghani, A. C. (2020). The impact of COVID-19 and strategies for mitigation and suppression in low-and middle-income countries. *Science*, 369(6502), 413-422.

Wang, P. (2019). On defining artificial intelligence. *Journal of Artificial General Intelligence*, 10(2), 1-37.

Wang, Q., Yang, T., & Li, R. (2023). Does income inequality reshape the environmental Kuznets curve (EKC) hypothesis? A nonlinear panel data analysis. *Environmental Research*, 216, 114575.

Wang, X., & Cheng, Z. (2020). Cross-sectional studies: strengths, weaknesses, and recommendations. *Chest*, 158(1), S65-S71.

Wang, Y., Wang, Y., & Li, Z. (2020). Gender differences in computer science learning: A systematic review and meta-analysis. *Computers & Education*, 143, 103651.

Watson, J. H., &Rockinson-Szapkiw, A. (2021). Predicting preservice teachers' intention to use technology-enabled learning. *Computers & Education*, 168, 104207.

Weerabahu, S. K., Samaranayake, P., Dasanayaka, S. S., & Wickramasinghe, C. N. (2022). Challenges of agri-food supply in city region food systems: an emerging economy perspective. *Journal of Agribusiness in Developing and Emerging Economies*, 12(2), 161-182.

Westreich, D., Edwards, J. K., Lesko, C. R., Cole, S. R., & Stuart, E. A. (2019). Target validity and the hierarchy of study designs. *American journal of epidemiology*, 188(2), 438-443.

Wiese-Bjornstal, D. M. (2018). Sociocultural aspects of sport injury and recovery. In Oxford research encyclopedia of psychology.

Wing, C., Simon, K., & Bello-Gomez, R. A. (2018). Designing difference in difference studies: best practices for public health policy research. *Annual review of public health*, 39(1), 453-469.

Winn, W. (2002). Research into practice: Current trends in educational technology research: The study of learning environments. *Educational psychology review*, 14, 331-351.

Winton, B. G., & Sabol, M. A. (2022). A multi-group analysis of convenience samples: free, cheap, friendly, and fancy sources. International *Journal of Social Research Methodology*, 25(6), 861-876.

Wolff, G., Limpens, R. W., Zevenhoven-Dobbe, J. C., Laugks, U., Zheng, S., de Jong, A. W., ... &Bárcena, M. (2020). A molecular pore spans the double membrane of the coronavirus replication organelle. *Science*, 369(6509), 1395-1398.

Wong, J. E., Leo, Y. S., & Tan, C. C. (2020). COVID-19 in Singapore—current experience: critical global issues that require attention and action. *Jama*, 323(13), 1243-1244.

World Health Organisation. (2022). COVID-19 Pandemic Report. (WHO Report No. 0123). World Health Organisation.

Wu, Z., Shen, C., & Van Den Hengel, A. (2019). Wider or deeper: Revisiting the resnet model for visual recognition. *Pattern recognition*, 90, 119-133.

Wulff, J. N., Sajons, G. B., Pogrebna, G., Lonati, S., Bastardoz, N., Banks, G. C., & Antonakis, J. (2023). Common methodological mistakes. *The Leadership Quarterly*, 101677.

Xue, S, & Churchill, D. (2020). Teachers' private theories and their adoption of affordances of mobile social media: a qualitative multi-case study of teachers' integration of WeChat I higher education in China. *Educational Media International*, 57(3), 208-232.

Yakubu, M. N., & Dasuki, S. I. (2019). Factors affecting the adoption of e-learning technologies among higher education students in Nigeria: A structural equation modelling approach. *Information Development*, 35(3), 492-502.

Yamagata-Lynch, L. C. (2014). Blending online asynchronous and synchronous learning. *International Review of Research in Open and Distributed Learning*, 15(2), 189-212.

Yang, S., Kim, J. K., & Song, R. (2020). Doubly robust inference when combining probability and non-probability samples with high dimensional data. *Journal of the Royal Statistical Society.* Series B, Statistical Methodology, 82(2), 445.

Yangben, P. N. (2014). Career challenges in construction craft training in technical vocational education and training in Ghana. *International Journal of Vocational and Technical Education*, 6(3), 13-29.

Ye, J. H., Lee, Y. S., Wang, C. L., Nong, W., Ye, J. N., & Sun, Y. (2023). The Continuous Use Intention for the Online Learning of Chinese Vocational Graduates in the Post-Epidemic Era: The Extended Technology Acceptance Model and Expectation Confirmation Theory. *Sustainability*, 15(3), 1819.

Yeager, D. S., Walton, G. M., Brady, S. T., Akcinar, E. N., Paunesku, D., Keane, L., ... & Dweck, C. S. (2016). Teaching a lay theory before college narrows achievement gaps at scale. *Proceedings of the National Academy of Sciences*, 113(24), E3341-E3348.

Yeong, Y. C., Kalid, K. S., Savita, K. S., Ahmad, M. N., & Zaffar, M. (2022). Sustainable cryptocurrency adoption assessment among IT enthusiasts and cryptocurrency social communities. *Sustainable energy technologies and assessments*, 52, 102085.

Zachlod, C., Samuel, O., Ochsner, A., &Werthmüller, S. (2022). Analytics of social media data–State of characteristics and application. *Journal of Business Research*, 144, 1064-1076.

Zayabalaradjane, Z. (2020). *COVID-19: Strategies for Online Engagement of Remote Learners. Online Submission*, 9(246), 1-11.

Zanoni, M. G., Majone, B., & Bellin, A. (2022). A catchment-scale model of river water quality by Machine Learning. *Science of the Total Environment*, 838, 156377.

Zha, L., Li, S., Pan, L., Tefsen, B., Li, Y., French, N., ... & Villanueva, E. V. (2020). Corticosteroid treatment of patients with coronavirus disease 2019 (COVID- 19). *Medical Journal of Australia*, 212(9), 416-420.

Zhang, T., Tao, D., Qu, X., Zhang, X., Lin, R., & Zhang, W. (2019). The roles of initial trust and perceived risk in public's acceptance of automated vehicles. *Transportation research part C: emerging technologies*, 98, 207-220.

Zhu, W., Xu, M., Chen, C. Z., Guo, H., Shen, M., Hu, X., ... & Zheng, W. (2020*). Identification of SARS-CoV-2 3CL protease inhibitors by a quantitative high-throughput screening. ACS pharmacology & translational science*, 3(5), 1008-1016.

Zhuo, T. Y., Huang, Y., Chen, C., & Xing, Z. (2023). Exploring AI ethics of ChatGPT: A diagnostic analysis. ArXiv preprint arXiv: 2301.12867.

Zickar, M. J., & Keith, M. G. (2023). Innovations in Sampling: Improving the Appropriateness and Quality of Samples in Organisational Research. *Annual Review of Organisational Psychology and Organisational Behaivour*, 10.

APPENDIX A

LETTER OF INTRODUCTION

To Whom It May Concern

Dear Sir/Madam,

My name is **Dhokura Eunice.** I am a DPhil student in the Department of Lifelong Learning and Development Studies at the Chinhoyi University of Technology. I am required to submit a thesis as a requirement. My study title is: **Framework to Enhance Technology Adoption Among Adult Learners in Zimbabwean Vocational Training Centres:** I am thereby supposed to collect data on these pertinent issues. It is my humble request that you agree to participate in this survey, by completing the questionnaire provided. The information will be strictly used for academic purposes and will be treated with a high level of confidentiality. Please feel free to participate or to withdraw in the event that you are not comfortable. Also, kindly take note that there are no financial rewards offered for participating in this study.

Your participation and cooperation will be greatly appreciated.

For any further clarifications please do not hesitate to contact me on cell number +263 773 477 323 or email address eunicedhokura@gmai.com.

Yours faithfully,

Dhokura E.

APPENDIX B

RESEARCH QUESTIONNAIRE FOR GRADUATES

FRAMEWORK FOR ENHANCING EDUCATIONAL TECHNONOLGY ADOPTION BY ADULT LEARNERS IN ZIMBABWEAN VOCATIONAL TRAINING CENTRES

This questionnaire is intended to gather data towards a framework enhancing technology adoption through adult learning in vocational training centres in Zimbabwe.

Kindly fill the questionnaire by ticking in the answer box that goes with your choice or fill in the required information on the space provided. For the purpose of confidentiality do not write your name or any other traceable particulars.

SECTION A: TYPES OF EDUCATIONAL TECHNOLOGY WHICH ARE CURRENTLY IN USE DURING VOCATIONAL TRAINING PROGRAMMES

	Strongly disagree	*Disagree*	*Neutral*	*Disagree*	*Agree*
	1	***2***	***3***	***4***	***5***
To what extent do you agree or disagree with the following statements related to types of educational technology which are currently in use during vocational training programmes? Please indicate your response by ticking (√) the appropriate block with the corresponding number in the 5-point scale (***1 = Strongly disagree; 2 = Disagree; 3= Neutral; 4 = Agree; 5 = Strongly agree***).					

A1.	Computer-aided design (CAD) software is used in vocational training centres to teach students technical drawing and design skills					
A2.	Online learning is a powerful teaching and learning approach that can facilitate effective engagement with course content and mastery of the concepts taught to graduates					
A3.	Mobile devices and tablets are used to support learning on-the-go and provide students with access to digital resources and tools.					
A4.	The face-to-face learning time needs to be valuable for graduates, promoting high student engagement.					

SECTION B: FACTORS INFLUENCING TECHNOLOGY ADOPTION IN VOCATIONAL TRAINING CENTRES,

To what extent do you agree or disagree with the following statements related to factors influencing technology adoption in vocational training centres? Please indicate your response by ticking (√) the appropriate block with the corresponding number in the 5-point scale (***1 = Strongly disagree; 2 = Disagree; 3= Neutral; 4 = Agree; 5 = Strongly agree***).		*Strongly disagree* ***1***	*Disagree* ***2***	*Neutral* ***3***	*Strongly Agree* ***4***	*Agree* ***5***
B1.	There were so many obstacles faced by educational technology users and determined mechanisms to enhance graduates' engagement while using e-learning system during the covid-19 pandemic.					
B2.	Graduates' educational background, gender and age are related to the adoption of new technologies.					
B3.	Attitude, Perceived usefulness (PU) and Perceived ease of use (PEOU) positively influences the intention to use mobile learning platforms					
B4.	There is a positive relationship between course design and quality of e-learning in vocational training centres.					

SECTION C: ATTITUDES OF ADULT LEARNERS TOWARDS MODERN EDUCATIONAL

		Strongly disagree	*Disagree*	*Neutral*	*Strongly agree*	*Agree*
To what extent do you agree or disagree with the following statements related to the attitudes of adult learners towards modern education? Please indicate your response by ticking (√) the appropriate block with the corresponding number in the 5-point scale (***1 = Strongly disagree; 2 = Disagree; 3= Neutral; 4 = Agree; 5 = Strongly agree***).		***1***	***2***	***3***	***4***	***5***
C1.	The positive attitudes and willingness of the majority ofgraduates to engage in distance learning classes in the post-COVID-19 pandemic indicate that there is an immense potential future for e-learning platforms in higher education institutions.					
C2.	Graduates with prior experience reported the deployed platform met their expectations in a similar way to the available solutions					
C3.	E-learning at the school context—positively affected their relationship with graduates and fostered classroom discourse					

C4.	some scholars believe that the graduates' attitude towards learning is swayed by the features of the classroom environment					

SECTION D: COMPETENCY OF FACILITATORS TOWARDS MODERN EDUCATIONAL TECHNOLOGY.

		Strongly disagree	*Disagree*	*Neutral*	*Strongly Agree*	*Agree*
To what extent do you agree or disagree with the following statements related to the competency of facilitators towards modern educational technology? Please indicate your response by ticking (√) the appropriate block with the corresponding number in the 5-point scale (***1 = Strongly disagree; 2 = Disagree; 3= Neutral; 4 = Agree; 5 = Strongly agree***).		***1***	***2***	***3***	***4***	***5***
D1.	Majority of teachers possessed the basic ICT Skills of TVET Teachers					
D2.	Difference between TVET Teachers' ICT Skills is due to their demographic factors					
D3.	It is to a greater extent that the TAM explains teachers' intention to use					

	technology in vocational education?					
D4.	There is the relationship between TDCB and teachers' technology acceptance					
D5	Teachers took a lot of time to prepare for e-learning prior to their first online teaching experience					

SECTION E: FRAMEWORK FOR EDUCATIONAL TECHNOLOGY INTEGRATION

	Strongly disagree	*Disagree*	*Neutral*	*Strongly Agree*	*Agree*
	1	***2***	***3***	***4***	***5***
To what extent do you agree or disagree with the following statements related to the framework for educational technology integration? Please indicate your response by ticking (√) the appropriate block with the corresponding number in the 5-point scale (***1 = Strongly disagree; 2 =***					

Disagree; 3= Neutral; 4 = Agree; 5 = Strongly agree).						
E1.	Educational framework improves student outcomes					
E2.	Empower graduates to choose the tools and platforms they use					
E3.	Develop a robust infrastructure to support technology adoption					
E4	Framework structure: vision, mission, good infrastructure, curriculum integration, assessment, evaluation, and continuous improvement.					
E5.	Effectiveness of educational tools assess the usability, accessibility, and user experience of the tools and platforms					

SECTION F: DEMOGRAPHIC DATA

Please indicate your response by ticking (√)one appropriate box per each question.

F1. Indicate your sex? Male ☐ Female ☐
F2. What is your age range? 18 – 30 years ☐ 31 – 40 years ☐ 41 – 50 years ☐ Above 50 years ☐
F3. What is your highest level of education? O Level /A Level Diploma ☐ Degree ☐ Masters and above ☐
F4. Which course are you undertaking at the Vocational training centre?

Motor mechanics	☐	Knitting	☐
Plumbing	☐	Painting	☐
Cutting and design	☐	Building	☐
Wood and Stone	☐	Carpentry	☐
Hotel and catering	☐	Hairdressing	☐

Other specify.....Receptionist courses, Electrical Engineering, Food Preparation

F5. For how long are you taking your studies?

Less than 6 months	☐	1 year	☐
2 years	☐	More than 2 years	☐

F6. Which department is you enrolled at the Vocational training centre?

Cosmetics	☐	Food and economics	☐
Engineering	☐	Cutting and design	☐

Other specify.....
.....

END OF QUESTIONNAIRE

……. **THANK YOU**! .....

VALIDATION

SECTION A question 1-4 (Singh, 2022)

SECTION B question 1(Alhumaid, Habes & Salloum 2021)

SECTION B question 2 (Gefen & Straub, 1997).

SECTION B question 3 (Abeysekera, 2022)

SECTION B question 4 (Cheong, 2021)

SECTION C question 1, 2 and 3 (Baena-Morales, Martinez-Roig & Hermadez- Amoros; 2020)

SECTION C question 4 (Mugahed Al-Rahmi & Yahaya, 2019)

SECTION D question 1, 2, 3 and 4 (Abdelmoic Ramadan, Xiaohui Chen & Laura L. Hudson, 2018)

SECTION D question 5 (Laai Canals & Amenah Al-Rawashdeh, 2018)

SECTION D questions 1, 2 and 3 (Christopoulos & Sprangers, 2021)

SECTION E question 1 (Markie et al., 2013)

SECTION E question 2 (McLoughlin & Lee., 2010)

SECTION E question 3 (Ma et a.,l 2019)

SECTION E question 4 (Ma et al., 2019)

SECTION E question 5 (Alturki& Ahmed, 2016)

APPENDIX C

LETTER OF INTRODUCTION

To Whom It May Concern

Dear Sir/Madam,

My name is **Dhokura Eunice.** I am a DPhil student in the Department of Lifelong Learning and Development Studies at the Chinhoyi University of Technology. I am required to submit a thesis as a requirement. My study title is: **Framework For Enhancing Educational Technology Adoption By Adult Learners in Zimbabwean Vocational Training Centres** I am thereby supposed to collect data on these pertinent issues. It is my humble request that you agree to participate in this survey, by completing the questionnaire provided. The information will be strictly used for academic purposes and will be treated with a high level of confidentiality. Please feel free to participate or to withdraw if you are not comfortable. Also, kindly take note that there are no financial rewards offered for participating in this study.

Your participation and cooperation will be greatly appreciated.

For any further clarifications please do not hesitate to contact me on cell number +263 773 477 323 or email address eunicedhokura@gmai.com.

Yours faithfully,

Dhokura E.

APPENDIX D

RESEARCH INTERVIEW GUIDE

FRAMEWORK FOR ENHANCING EDUCATIONAL TECHNONOLGY ADOPTION BY ADULT LEARNERS IN ZIMBABWEAN VOCATIONAL TRAINING CENTRES

This interview guide is intended to gather data towards a framework enhancing technology adoption through adult learning in vocational training centres in Zimbabwe.

Please answer all questions put to you freely, honestly and to the best of your knowledge. For confidential reasons, do not use your names, you shall use code names provided by the moderator.

SECTION A: TYPES OF EDUCATIONAL TECHNOLOGY WHICH ARE CURRENTLY IN USE DURING VOCATIONAL TRAINING PROGRAMMES

1. What are the different types of educational technology?
2. Is there a difference between graduates attending Blended Learning courses and students attending traditional classroom courses in their perception of Community of Inquiry (CoI)?
3. Do self-directed learning and technology readiness have equal influences on graduates' motivation and perception of CoI between Blended Learning and traditional classroom courses?
4. What can faculty; administrators and graduates do to make online, hybrid, and blended learning successful in the event of future disruptions that call for emergency remote teaching and learning (emphasis on the post-vaccine and post-pandemic world)?

SECTION B: FACTORS INFLUENCING TECHNOLOGY ADOPTION IN VOCATIONAL TRAINING CENTRES

1. What are the factors influencing the learning programmememes in TVET institutions during the COVID-19 Pandemic?

2. How university level graduates' behaivoural intention towards using m-LMS is influenced by the four main variables of the UTAUT model?

3. What is the influence of the external variables of perceived mobile value, academic relevance and university management support on both performance expectancy and effort expectancy?

4. Do the principal's management skills contribute to the attractiveness of a TVET institution?

SECTION C: ATTITUDES OF ADULT LEARNERS TOWARDS MODERN EDUCATIONAL

1. Are the resources available of the graduates for the use of ICTs?

2. Do you prefer the use of e-learning facilities to "face to face" learning in delivering lectures to graduates?

3. Do you think that e-learning facilities are simple and easy to use?

4. Do you think you have enough understanding of the technological functions, services, and potential benefits in an online learning setting?

SECTION D: COMPETENCY OF FACILITATORS TOWARDS MODERN EDUCATIONAL TECHNOLOGY.

1. Can teacher's digital competence influence technology acceptance in vocational education?

2. Has your motivation related to learning about and using digital technologies for teaching changed? In what way?

3. Does teachers experienced any changes in relation to their enjoyment of using digital technologies for teaching during covid-19 pandemic?

4. How do teachers feel of dissatisfaction/stress related to using digital technologies?

SECTION E: FRAMEWORK FOR EDUCATIONAL TECHNOLOGY INTEGRATION

1. What type of devices and internet connectivity do you have access to in your vocational training centre?
2. What kind of technical support is available to you in your centre?
3. What types of educational technologies have you found most effective in your teaching?
4. What are the biggest challenges the graduates face in using technology for learning?
5. How do you think technology can improve student engagement and motivation

VALIDATION

SECTION A question 1 (Miranda, Lobos & Hortsch, 2022)

SECTION A questions 2 and 3 (Geng, Law & Niu, 2019)

SECTION A question 4 (Singh, 2022)

SECTION B question 1 (Odanga Alex Musonye, Omuterema Oluchiri Stanley & Oteki Evans Biraori, 2021).

SECTION B questions 2 and 4 (Adel Abdulmonsen Alfalah, 2023)

SECTION B questions 4 (John Wanyonyi Simiyu, 2009)

SECTION C question 1 (Braun, 2008)

SECTION C questions 2 and 3 (Chinedu Uze, Chinedu-Uze & OluyemuBello, 2018)

SECTION C question 4 (Fong et al., 2022)

SECTION D question 1 (Antonietti, Cattaneo & Amenduni, 2022)

SECTION E question 1 (Stammen, 1995)

SECTION E question 2 (Beath, 1991)

SECTION E question 3 (Kearsley, 1998)

SECTION E question 4 (McElhinney & Nasseh, 1999)

SECTION E question 5 (Chuang, 2014)

APPENDIX E

LETTER OF INTRODUCTION

To Whom It May Concern

Dear Sir/Madam,

My name is **Dhokura Eunice.** I am a DPhil student in the Department of Lifelong Learning and Development Studies at Chinhoyi University of Technology. I am required to submit a thesis as a requirement. My study title is: **Framework For Enhancing Educational Technology Adoption By Adult Learners in Zimbabwean Vocational Training Centres**. I am thereby supposed to collect data on these pertinent issues. It is my humble request that you agree to participate in this survey, by completing the questionnaire provided. The information will be strictly used for academic purposes and will be treated with a high level of confidentiality. Please feel free to participate or to withdraw if you are not comfortable. Also, kindly take note that there are no financial rewards offered for participating in this study.

Your participation and cooperation will be greatly appreciated.

For any further clarifications please do not hesitate to contact me on cell number +263 773 477 323 or email address eunicedhokura@gmai.com.

Yours faithfully,

Dhokura E.

APPENDIX F

RESEARCH OBSERVATION GUIDE

FRAMEWORK FOR ENHANCING EDUCATIONAL TECHNONOLGY ADOPTION BY ADULT LEARNERS IN ZIMBABWEAN VOCATIONAL TRAINING CENTRES.

This interview guide is intended to gather data towards a framework enhancing technology adoption through adult learning in vocational training centres in Zimbabwe.

Please answer all questions put to you freely, honestly and to the best of your knowledge. For confidential reasons, do not use your names, you shall use code names provided by the moderator.

SECTION A: TYPES OF EDUCATIONAL TECHNOLOGY WHICH ARE CURRENTLY IN USE DURING VOCATIONAL TRAINING PROGRAMMES

1. What is the importance of digital classroom in education?
2. Which is the role of digital technologies applications in education?
3. What are the significant challenges of digital technologies in education?
4. What types of instruments are used to assess digital literacy, and how are instrument reliability and validity reported?

SECTION B: FACTORS INFLUENCING TECHNOLOGY ADOPTION IN VOCATIONAL TRAINING CENTRES,

1. Is there any relationship between the type or variety of courses and the attractiveness of a TVET institution to its clientele?
2. What mechanisms does a TVET institution use to make courses attractive to its clientele?
3. Do support services add any value to making a TVET institution attractive to its clientele?

4. Does the relationship between the learner characteristics and quality of e-learning in vocational education contribute to adoption of educational technology?

SECTION C: ATTITUDES OF ADULT LEARNERS TOWARDS MODERN EDUCATIONAL

1. During online learning, have you received adequate support from friends and family to overcome the encountered anxious situations and/or difficulties?

2. Do you intend to continue using technology to participate in online learning?

3. Does gender/age play an essential role in the formulation of behaivoural intention and actual use of e-learning tools during COVID-19?

4. How is the social behaivour of children with peers and in their environment based on religion?

SECTION D: COMPETENCY OF FACILITATORS TOWARDS MODERN EDUCATIONAL TECHNOLOGY.

1. What are the beliefs and attitudes of the participating teachers towards the use of technology for vocational training?

2. Which are common teaching practices with digital technologies and digital teaching competence for the educational integration of ICTs before the pandemic?

3. How do we analyse and describe teachers' self-perceived digital competence regarding their eco-responsible use of technology?

4. How best can we compare sustainable teaching digital profiles based on the socio-demographic variables of gender and educational stage?

5. How do we interpret the teachers' proposals of teaching practices to reduce the environmental impact of technology?

SECTION E: FRAMEWORK FOR EDUCATIONAL TECHNOLOGY INTEGRATION

1. Are there any interactive whiteboards, projectors, or display screens in use?
2. What is the level of student engagement and interaction with technology during the observation?
3. How is technology being used to enhance assessment and feedback practices?
4. How are graduates interacting with each other while using technology (e.g. collaborative, competitive)?
5. What is the level of student motivation and interest in using technology for learning?

VALIDATION

SECTION A question 1, 2 and 3 (Haleem et al., 2022)

SECTION A question 4 (Nguyen & Habok, 2023)

SECTION B questions 1, 2 and 3 (John Wanyonyi Simiyu, 2009)

SECTION B question 4 (Cheong, 2021)

SECTION C question 1 and 2 (Fong et al., 2022)

SECTION C question 3 (Jamalova & Balint 2022)

SECTION C question 4 (Kuniawan et al., 2022)

SECTION D question 1 (Laai Canals & Amenah Al-Rawashdeh, 2018)

SECTION D question 2 (Jesus Valverde-Berrocosco, 2021)

SECTION D questions 3, 4 and 5 (Baena-Morales, Martinez-Roig & Hermadez-Amoros; 2020)

SECTION E question 1 (Painter et al., 2005)

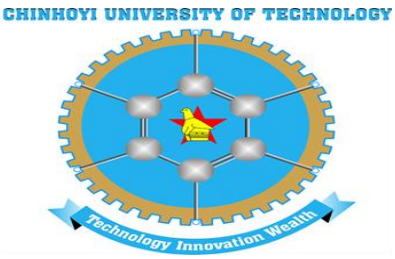
SECTION E question 2 (Henrie, Halverson & Graham 2015)

SECTION E question 3 (Nicol & Milligan 2006)

SECTION E question 4 (Romero et al., 2012)

SECTION E question 5 (Ciampa, 2014)

Appendix F: Interview Consent Form



PhD Thesis tittle

Framework For Enhancing Educational Technonolgy Adoption By Adult Learners in Zimbabwean Vocational Training Centres

Interview Consent Form

Participant Name

…….

Date

……/……/……..

- I confirm that my participation in this research is voluntary.
- I understand that I will not receive any payment for participating in this research interview.
- I understand that most interviews will find the discussion interesting and thought provoking, I have the right to decline to answer any question or to end the interview.
- I confirm that the research will last in a reasonable time.
- I understand the researcher will not identify me by my name in any reports using information from this interview and that my confidentiality as a participant in this study will remain secure.
- I have read and understood the explanation provided to me.
- I have been given a copy of the consent form.

- I wish to review the notes, transcripts, or other data collected during the research interview.
- I agree that the researcher may publish documents containing questions answered by me.

By signing this form, I agree to the terms indicated above

Participant's Signature	**Researcher's Signature**
……	**…….**
Date Signed	**Date Signed**
……/……/……	**…/……/……..**